1991

Restoration and Expansion of Bear River Migratory Bird Refuge, Brigham City, Utah, Environmental Assessment

U.S. Fish and Wildlife Service

RESTORATION AND EXPANSION
of
BEAR RIVER MIGRATORY BIRD REFUGE
Brigham City, Utah

ENVIRONMENTAL ASSESSMENT

October 1991

U.S FISH AND WILDLIFE SERVICE
U.S. DEPARTMENT OF INTERIOR

UNITED STATES FISH AND WILDLIFE SERVICE

REGION 6

ENVIRONMENTAL ACTION MEMORANDUM

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA) and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record and have determined that the action of **enhancing and expanding the Bear River Migratory Bird Refuge** is found not to have significant environmental effects as determined by the attached Environmental Assessment and Finding of No Significant Impact.

* Galen L. Buterbaugh — Regional Director, GALEN L. BUTERBAUGH — 9-16-91 Date

(4) Assistant Regional Director, Refuges and Wildlife — 9/12/91 Date

(3) Associate Manager, Zone I — 9/12/91 Date

(2) Regional Environmental Coordinator — 9-9-91 Date

(1) Refuges and Wildlife, NEPA Coordinator — 9/5/91 Date

*As delegated by 4 AM 4.1 Director Order No. 5

FINDING OF NO SIGNIFICANT IMPACT

Enhancement and Expansion

of

Bear River Migratory Bird Refuge

Brigham City, Utah

Based upon the analysis in the attached Environmental Assessment, I find that the preferred alternative will not have a significant impact on the human environment. I therefore conclude that no Environmental Impact Statement is necessary.

My rationale for this finding follows:

1. Threatened and endangered species will benefit.
2. The current loss of wildlife benefits on the Refuge over the last several years will be reversed.
3. Additional fresh water marsh habitat will be protected.
4. The ability to manage water within smaller marsh units will allow reduction in and control of botulism outbreaks.
5. The local and regional economy will benefit.
6. The adverse impacts on biological and physical resources will be minor and short-term.

Galen L. Buterbaugh
Regional Director, Region 6
U.S. Fish and Wildlife Service
Denver, Colorado 80225

Date: 9-16-91

Attachment

DEPARTMENT OF INTERIOR

FISH AND WILDLIFE SERVICE

ENVIRONMENTAL ASSESSMENT

RESTORATION AND EXPANSION

BEAR RIVER MIGRATORY BIRD REFUGE

Brigham City, Utah

October 1991

Prepared by:
U.S. Fish and Wildlife Service
Division of Refuges and Wildlife
Region 6, Denver, Colorado

Principal Author:
Keith S. Hansen
Wildlife Biologist
Bear River Migratory Bird Refuge
Phone: (801) 723-5887

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This Environmental Assessment is designed to evaluate possible actions for preserving and managing the wetland habitat on Bear River Migratory Bird Refuge (Refuge) and to consider additional wetlands for protection of environmental, wildlife, and recreational values.

Because the entire Refuge and much of the proposed expansion area were flooded by the Great Salt Lake beginning in 1983, much of the existing habitat has been destroyed. In 1987, flood waters reached peak elevation, covering all Refuge dikes with approximately four feet of water. Although it receded rather rapidly, much of the marshland habitat and all Refuge facilities were damaged or destroyed. With this in mind, the U.S. Fish and Wildlife Service (Service) is evaluating management options for the reconstruction and/or expansion of the Refuge.

The issues raised during the review of the Refuge proposal and from public input can be categorized as follows: Wildlife/Wildlands Protection and Management, Local and Regional Economics, Tourism and Recreation, Agricultural Practices, and Water Resources and Water Rights.

Numerous alternative actions that would fulfill the Service mission were discussed, four of which were selected for consideration: 1) No Action, 2) Restoration of Existing Refuge, 3) Enhancement of Existing Refuge, and 4) Enhancement and Refuge Expansion, the preferred alternative.

Under the Expansion Alternative, the Service would expand the Refuge through land acquisition of 38,200 acres. This action allows for intensive wildlife and public use development and protection of wetlands situated outside the present boundary. Two types of land acquisition are proposed--fee-title: 16,891 acres and perpetual easements: 21,309 acres.

The Refuge would be subdivided, from five large units into 29 smaller units. Each would have individual water management capabilities, allowing more efficient use of water resources. Water delivery systems would be constructed to handle surplus water from the spring runoff, routing it through the Refuge to prevent flooding of nesting birds.

Land purchase would allow construction of an administrative complex adjacent to InterState Highway 15 with a visitor center, two auto tour routes, nature trails, and an environmental education center.

Under this alternative, the current loss of wildlife benefits on the Refuge over the last several years would be reversed.

Two endangered species, the bald eagle and the peregrine falcon would show increased use days, as would two species of concern--the white-faced ibis and the snowy plover. Waterfowl production is expected to increase by 60,000, with emphasis on species of concern. An increase of 66,500,000 waterfowl use days is expected. Other migratory birds would have improved nesting habitat and increase by 38,000,000 use days.

With the control of carp in the Refuge units through screening of the inflow water, natural wildlife food and cover would improve.

The ability to manage water within smaller marsh units would allow reduction in and control of botulism outbreaks.

An additional 35,040 acres of fresh water marsh habitat would be placed under protection as a component of the National Wildlife Refuge System.

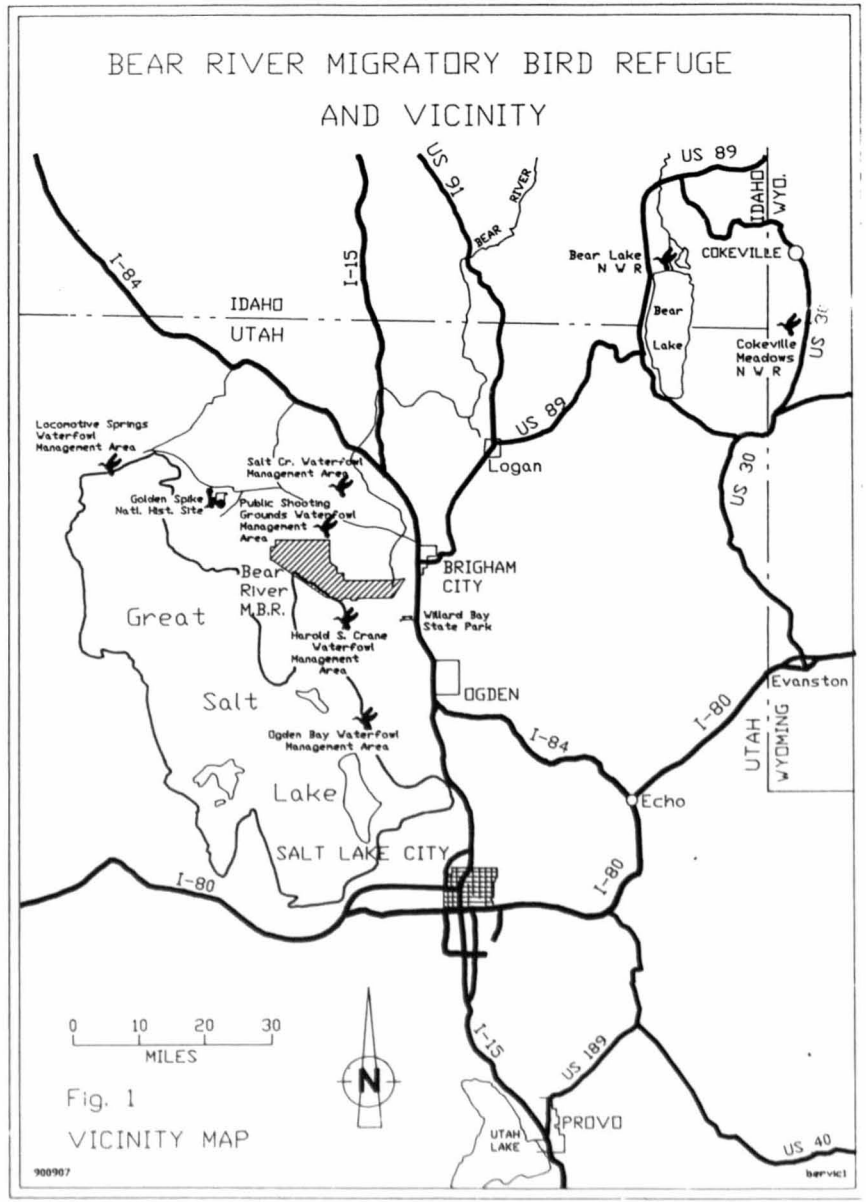
The local economy would benefit in several ways. Land purchases would add $8,700,000 to the economy over a period of years and the county would receive $9,000-$15,000 in Payment in Lieu of Taxes over what they would have received from private tax payments. The Service would spend approximately $800,000 annually on salaries and supplies and approximately $10,000,000 over several years time for construction of management and recreational facilities. Overall, this alternative would benefit local and regional economy.

Nonconsumptive recreation would increase by 180,000 visits annually, while consumptive recreational use would increase by 16,100 visits. Through the visitor center, visitors would learn the history of the Refuge area, increase their understanding of natural ecosystems and wildlife, and become more environmentally informed. This alternative would add approximately $1.8 million per year to the local economy through money spent by Refuge visitors.

The Service would purchase, on a willing-seller basis, 16,900 acres in fee title, approximately 400 acres of which is agriculture land. This land would be placed in permanent wildlife cover. Up to seven families would need to relocate

their operations and approximately $15,000 per year would be lost in agricultural products.

The Service would purchase water rights amounting to 35 cubic feet per second on those lands acquired in fee title. The Refuge would consume 139,970 cubic feet of water more, creating an additional 3,800 acres of marshland habitat while improving habitat on the existing 25,000 acres of marsh.This alternative would correct many problems that have plagued the Refuge over the past twenty years. The inability to effectively manage water resources has resulted in marsh habitat losses. All wildlife species would benefit from improved management capabilities, and the downward trend in bird production and use would be reversed. Improved water control with smaller marsh units should do much to curb disease outbreaks and reduce the intensity when they do occur. The local and regional economy would benefit from the results of this alternative.



BEAR RIVER MBR ENVIRONMENTAL ASSESSMENT

I. PURPOSE OF AND NEED FOR ACTION

A. Purpose of Action

This Environmental Assessment (EA) is designed to evaluate possible actions preserving and managing the wetland habitat on the Refuge and to consider additional wetlands for the protection of their environmental, wildlife, and recreational values.

The purpose of the Refuge is to provide feeding, breeding, and resting habitat for migratory birds and other wildlife while maintaining the natural diversity of plants and animals native to the lower Bear River Basin.

The purpose of the expanded Refuge would be to protect, enhance and manage nationally significant wetlands for wildlife, public use, and other wetland values.

The Bear River Basin's unique wildlife values have been recognized nationally as an historical waterfowl and waterbird area enjoyed by the public through hunting, trapping, sightseeing, photography, and nature study activities. The purpose of the action is to preserve and manage these values for future generations.

B. Need for Action

Preservation of the basin marsh ecosystem associated with Bear River is critical to the support of diverse populations in the area. Besides waterbirds and other wildlife dependent on wetlands, there are migratory birds, amphibians, reptiles, furbearers, and other species dependent on the surrounding habitat.

Beginning in 1983, the entire Refuge and much of the proposed expansion area were flooded by the Great Salt Lake, which destroyed much of the existing habitat. In 1987, flood waters reached their peak elevation at a level of 4211.85 feet, covering all Refuge dikes with approximately four feet of water. Although the waters receded rapidly, much of the marshland habitat and all Refuge facilities were damaged or destroyed. With this in mind, the Service is evaluating

management options for the reconstruction and/or expansion of the Refuge.

Wetlands around the Great Salt Lake are internationally significant and are recognized for their wildlife, water quality, and recreational values. It has been widely acknowledged that wetland habitats are in short supply nationwide and are being lost at a greater rate than any other wildlife habitat. Although wetlands represent the smallest percentage area of all wildlife habitat types in Utah, they support the greatest density, diversity, and productivity of fauna.

The area is utilized by three species of birds considered Category 2 candidate species for listing under the Endangered Species Act: Western snowy plover, long-billed curlew, and white-faced ibis. Category 2 consists of "taxa for which information now in possession of the Service indicates that proposing to list as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat are not currently available to support proposed rules." Two endangered species, the bald eagle and the peregrine falcon, use the Refuge and proposed expansion area for hunting. Bald eagles winter around the Great Salt Lake, feeding on fish and ducks. There is an active peregrine falcon eyrie in the Brigham City area. The Refuge and adjoining areas are well within the hunting range of the peregrine, known to frequent these areas.

There are national concerns regarding the long-term status of waterfowl populations and the loss of waterfowl habitat throughout the country. Once flourishing habitats, such as the Refuge, now support a mere fraction of their former wildlife populations. Refuge records show a sixteen percent decrease in waterfowl use days; goose production has dropped about fifty percent; duck production is down nearly seventy percent; and the number of birds taken during hunting season has declined substantially. We can summarize the trend over the past thirty years as follows: 1) fewer

waterfowl use the Refuge, 2) waterfowl production has declined, 3) waterfowl harvest has decreased (though not as markedly as use or production), and 4) botulism losses continue to increase at an unchecked rate. Based on the above conditions, the Service recognizes the need to improve Refuge water management facilities to rejuvenate the marsh, provide better management capabilities, and expand protection to wetlands and wildlife resources.

Most of the 38,200 acres identified for Refuge expansion have been identified as wetlands worthy of protection in the Concept Plan for Preservation of Redhead Breeding Habitat in the Great Basin (1980). Not only is this area and the existing Refuge habitat a major redhead nesting ground on the shores of the Great Salt Lake, it is considered one of the finest in the nation. (McQue, 1989). The area is part of Category 30 of the North American Waterfowl Management Plan.

C. Consistency of Action

In planning land acquisition activities, the Service attempts to ensure consistency between its actions and statewide comprehensive planning and other adopted plans and programs at the state, local, and regional levels. In addition, the Service attempts to establish a relationship between its proposals and the national goals set forth by congressional and administrative directives. This becomes particularly important in areas where other Federal agencies are heavily involved already in land management activities.

The Service, in proposing the actions presented herein, derives authority from The Fish and Wildlife Act of 1956, the Endangered Species Act of 1973, the Migratory Bird Conservation Act, the Bear River Migratory Bird Refuge Act of 1928, and the Land and Water Conservation Act of 1965. Habitat proposed for acquisition would be managed as part of the National Wildlife Refuge System. Authority for acquisition is provided in the Migratory Bird Conservation Act, the Land and Water Conservation Fund Act, the Emergency Wetland Resource Act, and the Fish and Wildlife Act. Regulations and guidelines for day-to-day management of the proposed area would be in accordance with the National Wildlife Refuge System Administration Act (16 U.S.C. 668dd-668jj).

In the development of this EA, the Service has initiated actions to ensure compliance with both the letter and the spirit of the National

Environmental Policy Act 1969, as amended. Scoping activities were undertaken in developing the EA with a variety of Federal, State, and local entities. Input was solicited through a public meeting held on December 4, 1989, personal contacts, telephone interviews, and correspondence. Key environmental issues directly associated with the potential acquisition of land by the Service were identified and will be detailed in the EA. Other issues brought forth in developing the alternatives centered on possible management activities that could be undertaken by the Service and will be discussed in future management planning documents. To ensure consistency, the Service has established standard procedures for setting land management missions, goals, and objectives. The mission statement, goals, and objectives for Bear River Migratory Bird Refuge have been incorporated into Appendix A.

The Service has stated in its expansion proposal that the area under consideration would be dedicated to the protection and enhancement of migratory birds and other wildlife and would provide wildlife interpretative values by means of a visitor center. The principal legislative authority for the proposed acquisition would be the Emergency Wetland Act, though acquisition could occur under other legislative authorities.

II. ISSUES OF CONCERN AND OPPORTUNITIES

Numerous issues were raised during the review of the Refuge proposal and from public input and can be categorized as follows:

A. Wildlife/Wildlands Protection and Management

Additional protection is needed. Who can best manage wildlife/wildlands in the area--the Federal government, the State, or private hunt clubs? A management system must be developed to address botulism. How does our proposal fit into the North American Waterfowl Plan? Will predator management continue on the area?

B. Local and Regional Economics

Lands purchased by the Service would be removed from the tax base. How will land acquired be purchased and appraised? What will be the effect on local economics?

C. Tourism and Recreation

With the Refuge in operation and visitor facilities developed, tourism and recreational opportunities will increase. Will fishing and public hunting be allowed, and will airboat access to the Great Salt Lake be allowed through the Refuge? What kinds of recreational facilities are proposed?

D. Agricultural Practices

How many farmers will be displaced and what is the need for this agricultural land? Will the croplands be leased back to the owners to farm? What about the use of pesticides within a ten-mile area of endangered species? Will the expanded boundary restrict adjacent landowners' farming practices?

E. Water Resources and Water Rights

Will the Refuge acquire additional water rights? Additional water in Bear River might have better uses than for wildlife/wetlands. The Refuge should better utilize existing water rights through management practices. Enhanced water management, where possible, can alleviate some botulism problems or reduce the magnitude of the outbreaks when they occur.

Discussion of conditions under each of the alternatives will focus on these major groupings in addition to proposed management activity. Discussion of consequences will also focus on these issues.

III. ALTERNATIVES

A number of alternative actions can be taken to meet the mission of the Service's Refuge System. The following alternatives were selected at the culmination of the project review for analysis in detail:

No Action - The area would remain as it is today. The Refuge would be allowed to revert to an appearance preceding development.

Restoration - Most of the Refuge would be restored to the conditions existing prior to the damage caused by the flood. Dikes and water control structures would be repaired, but no permanent buildings constructed.

Enhancement - Existing Refuge lands would be more intensely managed for migratory birds. Additional dikes would be built to divide the units, each having water management capabilities.

Expansion (Preferred Alternative) - The Refuge boundary would be expanded through land acquisition to allow for intensive wildlife and public use development and for protection of existing wetlands occurring outside the present boundary. Acquisition would occur on a willing-seller basis.

An alternative that was discussed but rejected as having no merit:

Divest - The Service would transfer, sell, or otherwise divest itself of the lands now included in the Refuge. State lands within the Refuge would revert back to state ownership, and other lands would be handled according to federal laws concerning disposition of surplus lands. Congressional action would be required, and Congress has stated numerous times over the past decade that lands would not be allowed to be removed from the National Wildlife Refuge System.

The establishment of units of the Refuge System carries with it a commitment to provide varying levels of resource management. Detailed management plans will be developed as funds and staff become available. General management objectives can provide insight into possible steps taken to enhance the resource potential of any given area. Management objectives are the means by which the Service ensures that activities and programs on National Wildlife Refuges are responsive to and consistent with the Service mission, goals, and policies. The Service provides objectives that each alternative must be compared with to determine whether it meets the minimum needs for preservation and enhancement of wildlife resources. An analysis of the alternatives was made by the Service, and the Preferred Action was selected as most closely meeting all objectives. A Summary Matrix (Table 1) displays the consequences of the alternative.

Management of National Wildlife Refuges must comply with existing laws and regulations and adhere to sound resource management principles. Therefore, certain management policies, based on these laws and principles, apply to all alternatives.

Cultural Resources - Cultural resources on the Refuge, both historical and prehistorical, will be protected from damage in

accordance with the National Historic Preservation Act of 1966, as amended (Public Law 16 U. S. Code 470). They will either be preserved at the original location or excavated and recorded. Every effort will be made to preserve those sites of known or suspected importance. In addition, when new developments are planned, the area will be examined for any sites that might be impacted. If found, such sites will be preserved.

Endangered Species - The proposed action is not likely to affect any Federally-listed threatened or endangered species. If determined in the future that the implementation of any management plan for development may affect any threatened or endangered species, formal Section 7 Intra-Service Consultations of the Endangered Species Act of 1973, as amended (16 U. S. Code 1531-1543) will be requested beforehand.

State-listed threatened and endangered species will also be protected. Inventories will be conducted to gain more knowledge of these species, and actions will be taken to benefit important state species.

Predator Management - Due to restricted upland habitat on the Refuge, predators have been significant in holding down the production of waterfowl. For many years, these predators have been actively controlled by Service personnel along those Refuge dike systems that serve as travel lanes. The striped skunk causes the most damage, although red fox, raccoon, long-tailed weasel, mink, and coyote contribute. Avian predators, especially corvids, may also be a concern, and anecdotal evidence indicates local increases in breeding ravens and crows. Control of these predator species will continue as needed to meet Refuge production goals shown in Appendix A.

Wetland and Floodplain Protection - The Presidential Executive Orders on the protection of wetlands (Presidential Order 11990, Wetland Protection) and the floodplain (Presidential Order 11988, Floodplain Management) will be followed. No permanent buildings will be constructed on the floodplain.

Bear River Upstream Storage - A storage project upstream from the Refuge on the Bear River would solve many water problems on the Refuge. Storage should allow a more even flow of the river

throughout the year, thereby reducing spring flooding and the late summer drought. The Service will consider the concept of upstream storage, providing it can be accomplished in an environmentally sound manner benefitting all alternatives. However, since this project would occur off Refuge lands and the Refuge has no authority or direct control over construction of such a project, it will not be considered further in this EA.

Refuge Compatibility - According to the National Wildlife Refuge Systems Administration Act of 1966, uses of National Wildlife Refuges are permissible when "compatible with the major purposes for which such areas were established." These uses support or do not conflict with Refuge purposes. Many factors must be considered in determining compatibility. While major actions must be discussed with others, the final decision rests with the Service.

Refuge Management Plans - Management plans containing details for accomplishing individual parts of the Master Plan will be developed as needed. These plans will include information regarding such activities as law enforcement, safety, signing, hunting, and fishing. When these plans are of concern to other groups, the Service will offer the public and other Federal, State, and local agencies an opportunity to participate in decision-making processes.

Permits - The Service will obtain all permits needed for maintenance and construction work on the Refuge before construction begins. Examples: Corps of Engineers 404 Permits under the Clean Water Act; Section 7 Consultations under the Endangered Species Act.

Aesthetic Resources - The National Environmental Policy Act of 1969 (NEPA) requires agencies to consider aesthetic impacts of proposed Federal actions, including scenery, noise,and odor. The Service will preserve and enhance these resources to the extent that Refuge objectives can be fulfilled. A natural, undisturbed appearance is the visual standard applied to Refuge projects such as habitat rehabilitation and island creation. If this standard cannot be met, actions will be taken to mitigate any negative impacts.

A. No Action Alternative

The No Action Alternative describes maintenance of the current condition. Although some minor flood repair work has been done by Refuge volunteers, the Service would not spend additional funds on

repairs. No flood repair work would be completed, and the Refuge would be under a custodial-type management. Refuge lands would be protected by a limited staff, with boundaries posted and laws enforced to protect property and resources.
Lands currently owned by the government would be protected, but there is no assurance that lands in the proposed acquisition area would be protected since they would remain in private ownership. These private lands would be managed much the same as they are today.

B. Restoration Alternative

The Service would request funds and a work force to restore the Refuge to its condition prior to the flooding of the Great Salt Lake. Existing physical features would be repaired (dikes, water control structures, canals, etc.) and restored to pre-flood condition.

Items pertaining to private and Refuge owned lands would remain as outlined in the previous alternative.

Physical features would be restored, and there would be five large impoundments of approximately 5,000 acres each. Existing water control structures would be repaired, and water management would be possible again. Canals and water distribution systems would be cleaned of silt and made useable. No permanent buildings would be replaced since all lands owned by the Service are in the flood plain.

Units would be managed much as they have been in the past with some modification to improve habitat conditions for the needs of wildlife. Moist soil management would be undertaken to provide habitat outside the main dike area by means of contour furrowing. Predator management would maintain a balance between predator species and waterfowl nesting objectives. Fish screens would be installed in some units to prevent carp from entering.

Botulism would remain a problem. Large water units would continue to lack water during the late summer. Bird carcasses would be collected and destroyed during botulism outbreaks to slow down the spread of the toxin, but no techniques are available to prevent the outbreaks.

Water control would remain a major problem under the Restoration Alternative. Problems associated with large water impoundments and limited water inflow in the late summer would not be solved. Although the Refuge has a filed water right for 1,000 cfs, the water is not available in the river, and inflows can not keep up with evaporation. Water would continue to be diverted at the headquarters control structures, the Reeder Overflow Canal, and the Whistler Canal to provide water to the units; however, water quantity is not available to maintain these units in the late summer period. Spring flooding would continue, and all flood waters would have to be diverted through Refuge impoundments. Water quality within Refuge impoundments cannot be maintained at a satisfactory level in the late summer months.

Fishing, hunting, trapping, birdwatching, and photography would be allowed as long as they are consistent with the purpose of the Refuge. An auto tour route would be available, minus turnouts and other facilities. Minor visitor contact facilities would be provided. Environmental educational opportunities would be limited.

C. Enhancement Alternative

Additional funding and staffing would be required to develop plans and strategies to improve the existing Refuge habitat and facilities. Large marsh units would be subdivided into smaller, more manageable units with a series of additional dikes. A new water delivery system would be designed to reuse water several times before it flows into the Great Salt Lake. The major water diversion canals would be designed to accommodate excess spring flows, bypassing Refuge units en route to the Great Salt Lake. A large portion of the spring flows would be used to flush and fill the Refuge units. Contour furrowing outside the main dike area would be completed to further improve habitat.

Physical facilities would be enhanced to provide improved wildlife habitat, solving some current Refuge problems, but not all. This alternative includes all those items mentioned in Alternative B.

While water quantity would not be increased under this alternative, better control of present water supplies is possible. In addition, smaller habitat units would allow the Service to maintain water quality through the late summer by limiting the area needing fresh

water. Units within the Refuge would be dried out and flushed on a rotation basis unless disease outbreaks dictate otherwise. Some wetland habitat would be allowed to dehydrate during abnormally dry years. Fish screens would be installed on water control facilities supplying water to the Refuge from the Bear River.

Public use opportunities under this alternative would be similar to those described under the Restoration Alternative. Forty percent of the Refuge's managed area would remain open to waterfowl hunting.

D. Expansion Alternative (Preferred Service Alternative)

This preferred action would include all items contained in Alternatives B and C as well as the acquisition of wetlands identified as important to wildlife. In addition, it provides an opportunity for the construction of a visitor center, a new auto tour route, a nature trail, and an environmental education area. The Service would acquire up to 38,200 additional acres through fee purchase or easement agreements with willing land owners. Water rights and mineral rights, where possible, would be acquired with surface rights to the land.

Land acquisition would be in accordance with the Department of Interior and Service policies. Procedures for acquisition are contained in Appendix C.

The Refuge boundary would be changed to include all lands the Service wishes to acquire through easement or fee purchase. Inclusion of lands within the boundary does not guarantee Service acquisition, but indicates that the Service wishes to protect it as part of the Refuge System. The Service would place all lands north of Forest Street under easement and acquire all lands south of the county road in fee title. Figure 4's Expansion Alternative Map, illustrates the new boundary.

This alternative includes the construction of a visitor center and the staff needed to provide information to the visiting public. Increased informational and interpretive signs, news releases, and educational movies would be available. New auto tour routes and nature trails would be designed in close proximity to the visitor center. Refuge leaflets would be updated and additional leaflets developed.

Environmental education efforts would be implemented and an educational center completed to assist educators in understanding natural environment. Environmental workshops would be held.

The Refuge would implement the Preferred Alternative and the master plan as funding becomes available. Acquisition of fee title or easements would be funded with Land and Water Conservation Funds or Migratory Bird Commission Funds.

IV. AFFECTED ENVIRONMENT

Conditions exist in and about the Refuge, which the Refuge may or may not directly affect, but that play an important part in the management decisions.

The Great Salt Lake marshes, including those on the Refuge, are a major ecosystem used by people and a variety of wildlife. The marshes have been deteriorating for years due to urban encroachment, domestic and manufacturing use of water, filling and draining of marshlands for economic development, and activities within the floodplain of the streams that form these marshes. Almost all marshes were destroyed by the flooding of the Great Salt Lake that began in 1983. The lake reached its peak in 1987 and has been receding since, exposing most of the former marshlands habitat.

Despite the loss of marsh habitat, the Great Salt Lake and the Refuge remain extremely valuable to fish and wildlife, serving as a major stopping point on the migration route of birds in the eastern part of the Pacific Flyway. Its values are increasing since wild areas are dwindling throughout the region and nation. Although temporarily destroyed, the wetlands have not been lost and can be restored through fresh water manipulation.

Alternatives in this EA deal with items managed by the Service. Even the preferred alternative will not, on its own, reverse the trend of habitat deterioration around the Great Salt Lake since the Service lacks authority to address the whole problem. Solutions positively affecting the entire Great Salt Lake would have to be a joint effort between the State, Federal agencies, conservation groups, and private individuals.

Bear River Migratory Bird Refuge

Restoration Alternative

FIGURE 2

Bear River Migratory Bird Refuge

Enhancement Alternative

FIGURE 3

Bear River Migratory Bird Refuge

Expansion Alternative

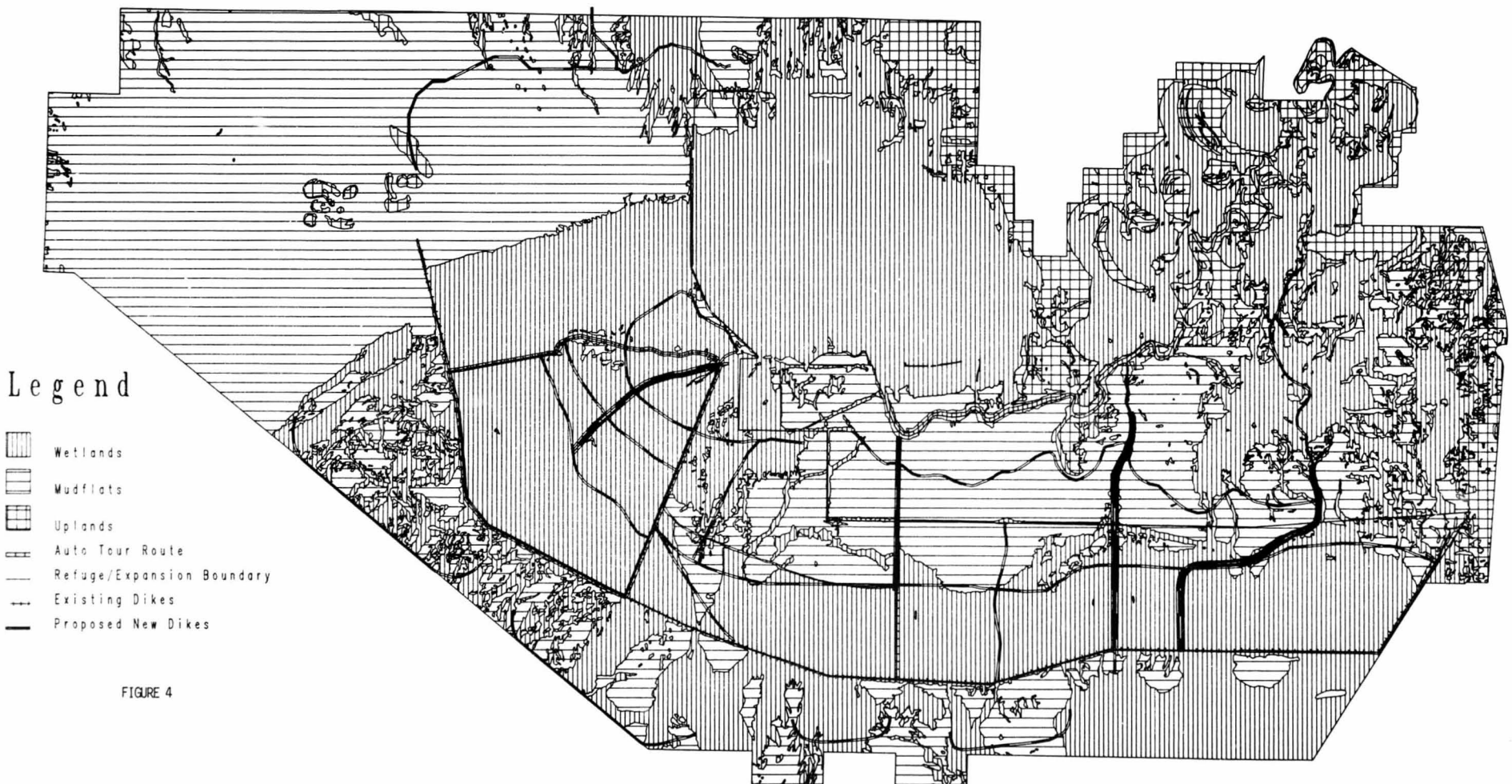


FIGURE 4

Bear River Migratory Bird Refuge

Expansion Alternative

With FEE/EASEMENT Acquisition and Visitor Center Development

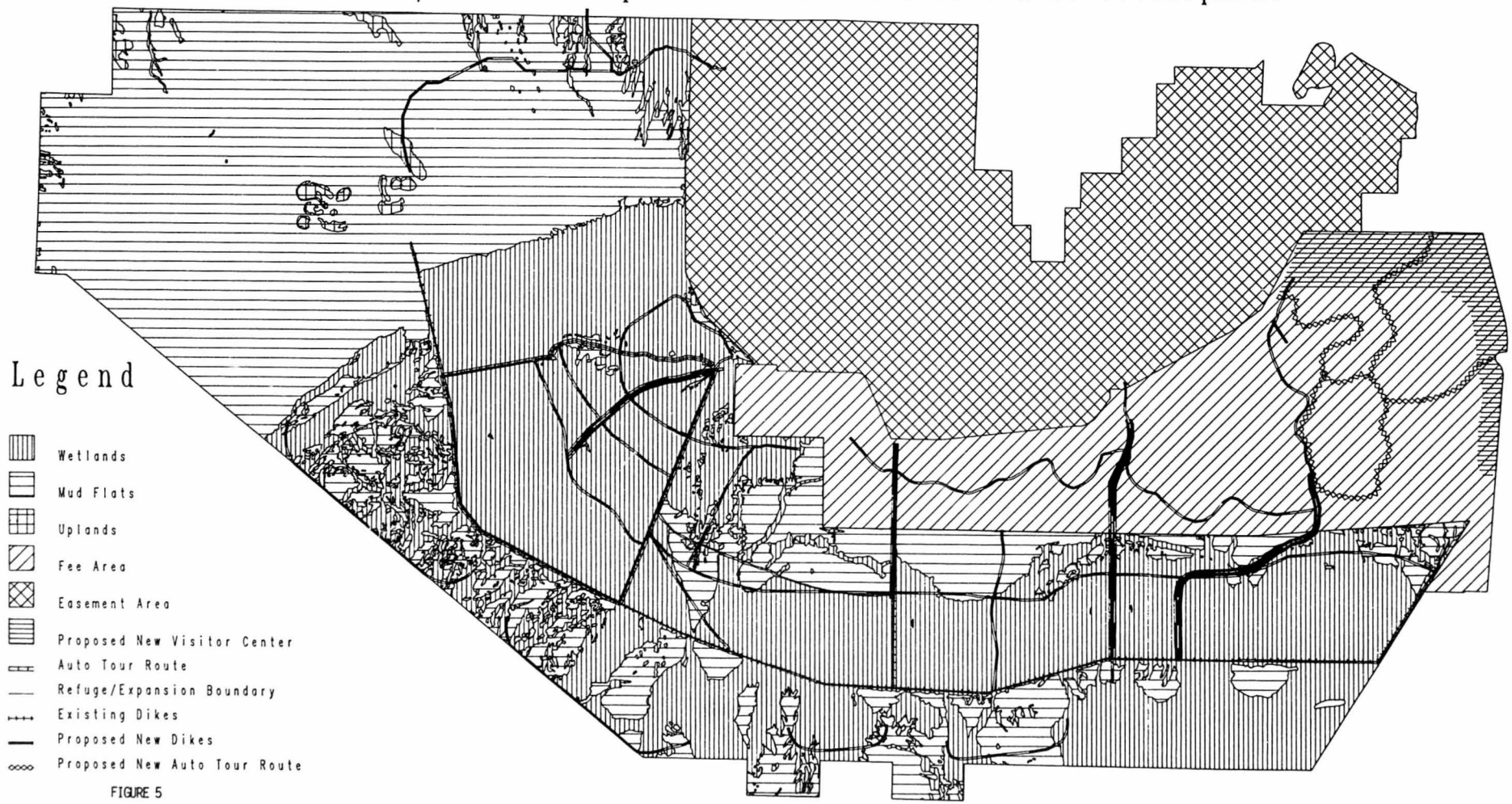


FIGURE 5

A. Climate

In general, the area has a semiarid, continental climate with four well-defined seasons. Summers are hot and dry, but not oppressive, since relative humidity averages between 20 and 30 percent. Maximum temperatures of 90 degrees or higher occur 30 to 40 days each summer. Nights are usually cool. The average evaporation rate is 60 inches. Most summer precipitation comes from thunderstorms, and winters are cold, but usually not severe. The Rocky Mountains to the east and northeast act as a barrier to invasions of cold continental air. Consequently, extended periods of extremely cold weather are rare. On the average, a minimum temperature below zero occurs less than 10 days per year.

There is marked variation in the seasonal precipitation, most of which falls in winter and spring. The wettest month is April or May, and midsummer is usually the driest part of the year.

Winds are generally light to moderate during all seasons, but strong damaging winds occur occasionally when easterly winds blow out of the canyons or when westerly winds are associated with severe thunderstorms or cold fronts.

B. Air Quality

Air quality tends to be dictated by prevailing wind patterns. In the Refuge area, both surface and upper level winds are moderate to strong and generally from the west-southwest. Long-term wind patterns, combined with atmospheric stability and mixing height, influence transport of pollutants and explain rare inversion events. Air quality is generally very good with low ambient concentrations of pollutants. State and Federal pollutant concentration standards indicate acceptable levels.

C. Soils

Soils within the Refuge and proposed area in Box Elder County have been completely inventoried, and detailed soil mapping is available. Three broad categories of soil types will be discussed briefly, as they have an important limiting factor on management.

1. Mudflats

These poorly drained, strongly saline soils consist of the Playas-Saltair Association. Permeability is slow. Although usually saturated, only two to four inches of water are available for plant growth due to high salinity. In many places, these soils are barren wasteland, but they have value as wildlife habitat. Mudflats account for 39,270 acres of the existing Refuge and proposed Refuge expansion.

2. Fresh Water Marshes

Occurring in natural depressions and manmade pond areas, these marsh areas are on nearly level valley plains where flooding occurs with the absence of surface drainage outlets. These areas are usually covered with fresh water and have a water table within twelve inches of the surface. They are well suited for wildlife habitat, and some are used as range during the winter months. Fresh water marshes account for 60,040 acres of the existing Refuge and proposed Refuge expansion.

3. Uplands

These are elevated soils that are rarely covered with water. Lewiston Fine Sandy Loam, Fridlo Silt Loam, and Warm Springs Fine Sandy Loam are excellent for all irrigated crops such as corn, alfalfa, and small grains. Cudahy Silt Loam, Logan Silty Clay Loam, and Payson Silt Loam are ideal for native pasture that is occasionally mowed for hay. Uplands account for 3,890 acres of the existing Refuge and proposed Refuge expansion. (USDA SCS).

D. Water

1. Bear River Basin Characteristics

The Refuge area lies at the mouth of Bear River. This river system rises in the Uintah Mountains of Utah and flows northerly in a loop through parts of Wyoming and Idaho and then back into Utah. The western hemisphere's largest river system not flowing into an ocean, the river covers a distance of 500 miles, flowing through a series of five major valleys separated by narrow canyons. The drainage basin of Bear River and its tributaries consists of 4.8 million acres of the three states through which it flows. This basin is about 150 miles long from north to south and about 100 miles wide from east to west.

Major water features associated with the river system include Bear Lake, which provides 1.42 million acre feet of storage and covers 67,000 surface acres. There are 155 additional lakes and reservoirs in the Bear River Basin with a minimum capacity of 20 acre feet. These provide nearly 480,000 acre-feet of storage and cover about 29,000 acres. The primary use of the storage facilities is irrigation, with secondary provisions for power and recreation activities.

Approximately 24 percent of the basin has soils that are either irrigated or have high potential for irrigation, if sufficient water were available. The remainder of the soils are suited only for grazing and forestry and have been classified by precipitation zone designations as high mountain, mountain, upland, and semidesert. Salts occur in most of the soils and cause a reduction in the quantity and quality of the vegetation. Groundwater reservoirs exist mostly in the valleys and near streams.

Basin-wide, water quality problems result from naturally high salinity and heavy sediment from tributary streams. Other quality problems result from high fecal coliform levels in certain sections of the river system, attributed to diffused, poorly defined runoff areas where coliform bacteria is collected from animal feces in pastures, fertilizer applied to land, and animal feeding operations.

The upper valleys and headwaters of Bear River have resisted change and support vestiges of original fauna and flora. In the middle and lower reaches, significant environmental alterations have occurred, resulting in many changes in the land and water base for wildlife. The waters of Bear River are diverted and impounded repeatedly to serve agriculture and power developments. Little water is available for any new developments in the watershed, except during periods of spring runoff when, in a normal year, 1,000,000 acre feet flow into the Great Salt Lake.

2. Local Watershed Characteristics

Within the existing Refuge and the proposed acquisition, the Bear River Delta and the river are the dominant natural features. There is only about six feet of fall in the river from the north boundary of the area to the mouth of the delta. The river area is

characterized by oxbows and entrenched meanders. Water tables, and a ground water aquifer receives recharge from high river flows and seepage from the river system. This aquifer is the source of supply for shallow well systems in the area.

The agricultural operations in the proposed area are dependent on irrigation water supplies. Sources include canal systems or water pumped from Bear River itself. Delivery of water to farmers/ranchers required the formation of corporations to operate and maintain the delivery systems. Most irrigation companies are incorporated as nonprofit organizations that issue capital stock representing the owner's share of water from the company's system. Stockholders are assessed to provide money for administering, constructing, operating, and maintaining facilities. A water master is assigned to issue water to users according to their stockholding. Water is delivered either on a rotational basis or on demand.

3. Surface Water Resources

Surface water resources in the Refuge area are the result of both natural and manmade forces. The flat relief and low stream gradient have resulted in a meandering river with numerous oxbows. As the river changed course over the years, previous channels and oxbows were cut off, leaving these areas as remnant wetlands. The whole complex is best described as a riparian ecosystem and incorporates all wetlands, flowing waters, and uplands within the 100-year floodplain.

Prior to settlement, vast natural marshes, interspersed with open water and wetlands, covered the area. As water from Bear River was diverted for other uses, these wetlands began drying up. In the 1920's, many were restored through diking by government

agencies and private groups using the areas they created as hunting clubs.

Ample water to manage the marsh units is normally available throughout most of the year, with the exception of mid-summer when river flows decrease to a point where not all marsh units can be maintained.

For a detailed report on Refuge water rights and a history of Refuge water use, see Appendix D.

E. Vegetation

Vegetation can be divided into the same three groups as the soil types:

1. **Mudflats**
   Samphire (Salicornia europaea rubra) is generally the only species present on the mudflats, but salt grass (Distichlis spicata stricta) and/or foxtail barley (Hordeum Jubatum) may invade the less alkaline areas.

2. **Wetlands**
   There are two aquatic and three typically emergent communities of wetlands as described by Robert G. Kaltwasser in his thesis, An Ecological Study of the Vegetation of the Bear River Migratory Bird Refuge.
   a. **Aquatic Communities**
      The sago pondweed (Potagmogeton pectinatus) community is by far the more common of the two aquatic communities, growing primarily in fresh to slightly brackish water (rooted in the mud bottom) 20 to 75 cm deep. It tends to be monospecific, forming dense underwater floating mats of vegetation. The fruits produced are an important source of food for waterfowl.

      The widgeon grass (Ruppia maritima)/horned pondweed (Zannichellia palustris) community tends to occur in shallower, more brackish water in more sheltered areas than the pondweed community. This community type is commonly found in water less than 20 cm deep.
   b. **Emergent Communities**

The hardstem bulrush (Scirpus acutus) community thrives in the freshest, deepest water, while the alkali bulrush (Scirpus maritimus paludosus) community sprouts in the driest, most saline areas, with the common cattail (Typha latifolia) community being more or less intermediate.

i. The hardstem bulrush community generally takes root in randomly-scattered clumps, which often stand ten cm or more above the surface and apparently serve to accrue sediments. Water depths of 15 to 30 cm are common.
ii. The common cattail community seems to flourish in somewhat shallower water and more saline soil than the hardstem bulrush community. Cattail has been found in wet soils and shallow water up to ten cm deep.
iii. The third emergent community, the alkali bulrush is, by far, the most abundant of the communities. This type occurs generally in the shallowest (up to ten cm deep) and most brackish water.

3. **Uplands**
   Upland vegetative communities can be divided into four naturally occurring communities and one man-imposed: agricultural land. Vegetative communities vary with the height of the land above the water table.
   a. Salt grass (Distichlis spicata stricta) is quite abundant and the community type is usually monospecific, or nearly so. Cover is dense, with only occasional solitary instances of other species. In June, most areas are moist to wet to shallowly flooded with fresh runoff water.
   b. The seepweed (Suaeda depressa)/bassia (Bassia hyssopifolia)/peppergrass (Lepidium perfoliatum) community occurs in seep areas of relatively high soil salinity on the side slopes of dikes. This community has an obvious vegetative zonation with seepweed lowest on the slope, bassia intermediate and peppergrass highest on the dike.
   c. The salt grass/foxtail barley community is dominated by salt grass though foxtail is usually prominent. This is the community characteristic of the ungravelled secondary silt dikes of the Refuge. A number of other species may be present in various combinations.
   d. The last naturally occurring community consists of wheatgrass (Agropyron cristatum)/Saltbush (Atriplex

sp.)/greasewood (Sarcobatus vermiculatus) and is the driest in the area. The community grows mainly in the northwest corner of the Refuge, in very dry soil removed from the effects of seasonal flooding, where the salinity appears to be very low.

e. The agricultural community covers approximately 400 acres on the north and east sides of the proposed expansion area. The crops normally grown on these areas are corn, alfalfa, and small grains, with some of the poor soils in irrigated pasture land. The existing Refuge has no agricultural lands.

4. Noxious Plants

There are fifteen species of plants listed by the State of Utah and Box Elder County as noxious weeds. State law states "noxious weeds standing, being, or growing on such land shall be controlled and the spread of the same prevented by effective cutting, tillage, cropping, pasturing, or treating with chemicals or other effective methods, or combination thereof, approved by the County Weed Supervisor, as often as may be required to prevent the weed from blooming and maturing seeds, or spreading by root, root stalks or other means."

The fifteen noxious weeds are: Bermudagrass (Cynodon dactylon), Bindweed (Convolvulus arvensis), Broad-leaved Peppergrass (Lepidium latifolium), Canada Thistle (Cirsium arvense), Johnson Grass (Sorghum halepense), Leafy Spurge (Euphorbia esula), Musk Thistle (Carduus nutans), Quackgrass (Agropyron repens), Russian Knapweed (Centaurea repens), Scotch Thistle (Onopordum acanthium), Whitetop (Lepedium perfoliatum), Dyers Woad (Isatis tinctoria), Star Thistle (Centaurea solstitialis), Medusahead Rye (Taeniatherum caputmedusae), and Jointed Goat Grass (Aegilope cylindrica).
The predominant species on the Refuge and in the proposed acquisition area include bindweed, broad-leaved peppergrass, Canada thistle, musk thistle, Russian knapweed, whitetop, and dyers woad.

5. Threatened and Endangered Plants

No known endangered plant species exist on the proposed Refuge acquisition or the Refuge proper.

F. Wildlife

1. Invertebrate Populations

Wetlands associated with marshes of the Bear River delta carry high invertebrate populations. Nesting waterfowl, waterfowl broods, and shorebirds are highly dependent on these protein food sources for healthy, vigorous growth. Invertebrates associated with the wetlands include worms, crustaceans, snails, and insects. The turbidity caused by carp reduces available light penetration and contributes to reduced aquatic macrophyte and invertebrate production. Because of the important role of invertebrates in the lives of waterfowl and other marsh birds, management practices should consider potential impacts on the invertebrate community.

By far, the most obvious invertebrates in the area are the high populations of midges (Chironomidae sp.) and shore flies, (Ephydridae sp.) which at times, darken the air or cover the shorelines. Thirteen families in four Orders are represented. (Huener, 1984).

2. Fishery

The fishery associated with the Refuge and proposed acquisition can be classified as warm water with low numbers of game fish, catfish, and higher numbers of species such as carp and suckers. Fishing is light to moderate in the vicinity of the Refuge: approximately 1,800 visits per year consisting of local residents. Carp infestations throughout the Bear River system suppress the production and diversity of rooted aquatic vegetation as well as associated aquatic invertebrates. Carp are abundant within all permanent water areas, such as the Bear River channel, borrow areas, and deeper water areas of the Refuge.

3. Reptiles and Amphibians

Five species of reptiles and amphibians have been documented in the Refuge area: Northern Leopard frog (Rana pipiens pipiens), Chorus frog (Pseudacris nigrita), Northern side-blotched lizard (Uta stansburiana stansburiana), Great Basin Garter snake (Thamnophis ordinoides vagrans), and the Red-sided Garter snake (Thamnophis sirtalis parietalis). There are probably other species on the upland areas of the proposed acquisition, but no documentation has been done, and the species expected to be

found would be those generally associated with northern Utah habitat.

4. Birds

Two hundred eight species of birds regularly visit the Refuge area. Sixty-two are known to nest there and another 17 species of accidental or extremely rare occurrence have been recorded. Many of these species are classified as species of high interest and the Refuge has a priority to increase or maintain current populations levels. Three species of birds are considered Category 2 candidate species for listing under the Endangered Species Act: western snowy plover, long-billed curlew, and white-faced ibis.

a. Endangered Species

The Refuge area is used by bald eagles as foraging habitat in the early spring and fall periods. These birds roost in the Willard Canyon area of the Wellsville Mountains a few miles to the east of the Refuge and fly daily to the Refuge to feed. As many as 250 eagles have used the Refuge and immediate area.

Peregrine falcons are regularly seen during migration periods and, for the last two years, a pair and their young have been noted near the headquarters area. These birds are from a site on the Bear River Club. Potential nesting habitat for peregrines exists in the Wellsville Mountains to the east of the Refuge.

b. Shore and Wading Birds

The area has long been recognized for its value to marsh and water birds. Before flooding, the Refuge attracted more use days for these species than for waterfowl, and provided a feeding ground for the large numbers of pelicans nesting on the islands of the Great Salt Lake. In recognition of this important aspect, the Refuge area and proposed acquisition, as well as other marshes on the northern end of the Great Salt Lake, have been designated as a Western Hemispheric Shorebird Reserve. Although the large concentrations of waterfowl were impressive, shore and wading birds probably attracted the largest numbers of visitors to the Refuge prior to flooding. Twenty-six species of this group nested on the Refuge area, and over 15 million use days per year have been recorded.

In 1973, twenty-four percent of the double-crested cormorants in Utah nested on the area proposed for acquisition. (Mitchell, 1975).

Bare to sparsely vegetated substrate of high salinity or alkalinity are used by the Western snowy plover for nesting. This type habitat is frequent in the proposed expansion area, especially south of Forest Street. In the spring of 1988, the nongame section of Utah's Division of Wildlife Resources began surveying adult snowy plovers during their breeding season. One of the findings of the survey was that relatively high numbers of plovers near the entrance of the Refuge were also notable. (Halpin, 1988). Twenty-eight adults were observed along the county road leading to the Refuge.

Historically, three colonies of white-face ibis colonies have been identified in the Refuge area. One colony was on the Refuge, while the other two were on the marshes in the acquisition area. From 1968 to 1978, nesting pairs in these three colonies fluctuated from a high of 4,300 in 1978, to a low of 450 in 1970. (Memorandum from Refuge Manager to Area Manager, August 28, 1978). In a 1985 report entitled, White-faced Ibis: Management Guidelines Great Basin Population, Region 1 of the Service identified limited availability of and competition for water by an increasing human population to be a major problem for these birds. The report specifically recommended that the Service (Region 6) and the Utah Division of Wildlife Resources (UDWR) identify 1) management actions necessary to provide and/or maintain ibis nesting habitat on Federal and State wildlife refuges and management areas and 2) needed management actions on privately-owned ibis habitat. The proposed expansion of the Refuge would bring at least three currently unprotected colonies under Federal protection and management. According to personal communications with Don Paul (UDWR), the upland areas in the proposed expansion area are extensively used by the long-billed curlew. The curlews utilize upland areas for both feeding and nesting. Acquisition of the area would allow the Service to aggressively manage it for the improvement of curlew habitat. Nesting sandhill

cranes have been noted on the Bear River Club with three pair producing young this past year.

Other species that commonly nest in the area include: eared, western, and pied-billed grebe; great blue heron; snowy egret; black-crowned night heron; California gull; Franklin gull; Forster's tern; killdeer; willet; American avocet; black-necked stilt; and Wilson's phalarope.

c. Raptors

Rough-legged hawks, golden and bald eagles, marsh hawks, and American kestrels are the most common raptors using the vicinity. Of these, only marsh hawks have been known to nest on the area. Other species using the area include: goshawk, sharp-shinned hawk, cooper's hawk, red-tailed hawk, Swainson's hawk, ferruginous hawk, prairie falcon, peregrine falcon, and merlin.

d. Waterfowl

The Refuge and surrounding area receives migrational use by thirty-one species of waterfowl. It has long been recognized as an area of prime importance to the nation's waterfowl. Recent peak numbers of waterfowl occurred in the mid-1950's and late 1960's at over 1 million birds. Since then, numbers have declined dramatically to only 150,000 in 1989, due to 1) declines in national waterfowl populations; 2) marsh habitat destruction by the flooding of the Great Salt Lake; and 3) a declining productivity of marsh habitat due to the inability to properly manipulate water levels.

i. Tundra Swans

Tundra swans have long used the area as a stop-over point on the their spring and fall migrations. In 1982, as many as 70,000 swans, half the continental population, were counted in the area during the fall migration. The State of Utah is one of the few states within the nation where the controlled hunting of swans is allowed. However, since the flood, numbers have dropped to less than 4,000 birds. With proper management and restoration of marsh habitat, this species is expected to show dramatic increases in use of the area.

ii. Geese

Four species of geese visit the area: the white-fronted goose and Ross' goose, both rare, the snow goose is

uncommon, and the Canada goose abundant. The Canada goose is the only species nesting in the area.

Canada geese numbers in the area increased rather dramatically through the late 1960's, as did populations nationwide. A peak fall population of almost 17,000 was recorded in 1967. Since then, however, numbers have been declining, and just prior to flooding in 1983, numbers were under 5,000. Canada goose production remained rather constant from the early 1950's through the late 1960's, exceeding 2,000 goslings produced each year. By 1983, production figures were down about 50 percent to 1,100 goslings.

iii. Trumpeter Swans

The area is well within the range of the trumpeter swan and has sufficient habitat to support these birds during the winter or migration period. While no trumpeter swans have been recorded in the area, these birds are expanding their range, and birds were identified on the Fish Springs National Wildlife Refuge near Callio, Utah in 1989.

iv. Ducks

There are twenty-seven species of ducks recorded in the area. Of this number, seven species of dabbling ducks and two of diving ducks nest. The principal nesting duck species include gadwall, cinnamon teal, and redhead. Peak populations of ducks occurred in the mid-1950's when over 1,100,000 ducks were present during the fall migration. By 1983, this number had dropped to just over 115,000.

Duck production has shown the greatest decrease of any documented wildlife use of the Refuge. Peak duck production of almost 79,000 ducklings occurred in the mid-to-late 1960's. By 1983, this figure had dropped to just under 12,500 ducklings. The thirty-one year period from 1953 through 1983 produced about 730,000 ducklings; however, the last ten years of this period, 1974 through 1983, produced only 100,000. Duck nesting surveys on the Refuge and adjacent private lands have demonstrated that a large percentages of all duck nests are found in hardstem

bulrush. Williams (1938) found that 39 percent of all nesting ducks nested in hardstem bulrush, which made up only three percent of the available habitat. Sixty-five percent of redhead and mallard nests were located in hardstem bulrush. In 1983, Refuge personnel found in their Duck Production Survey that 38 percent of all duck nests were located in hardstem bulrush. Percentages in other years varied, but an affinity for hardstem bulrush is evident. Williams also found that 90-95 percent of all duck nests were within forty-five feet of a channel. This habitat is at a premium on the Refuge, and the addition of the proposed acquisition, which is made up of wetland complexes with few large bodies of open water, would greatly increase nesting habitat. The lack of upland nesting habitat is a recurrent theme found in most Refuge reports and correspondence relating to waterfowl production in the late 1970's and the 1980's.

The Refuge is the major redhead nesting grounds on the shores of the Great Salt Lake and considered one of the nation's finest redhead production areas. The Refuge and proposed acquisition area have been identified as wetlands worthy of protection in the Concept Plan for Preservation of Redhead Breeding Habitat.

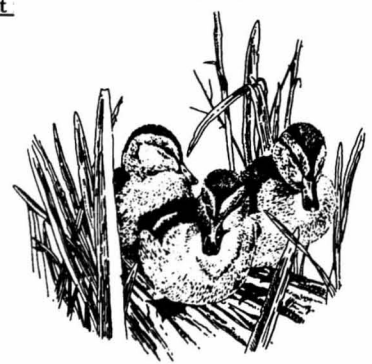


Table 1. PEAK DUCK POPULATIONS 1938 - 1989 (THOUSANDS)

Year	Number	Year	Number	Year	Number
1938	1,250	1956	905	1974	365
1939	2,000	1957	1,190	1975	397
1940	2,690	1958	1,150	1976	276
1941	1,688	1959	617	1977	212
1942	1,100	1960	730	1978	351
1943	2,084	1961	484	1979	229
1944	1,582	1962	496	1980	351
1945	1,000	1963	505	1981	147
1946	825	1964	834	1982	408
1947	732	1965	630	1983	187
1948	854	1966	366	1984	143
1949	950	1967	927	1985	15
1950	945	1968	1,082	1986	11
1951	705	1969	1,016	1987	40
1952	970	1970	407	1988	67
1953	980	1971	146	1989	150
1954	573	1972	165		
1955	749	1973	246		

Weller (1958) studied duck and wading bird populations on the fee acquisition area from 1950 to 1955. At the outset of his studies, he found lush vegetation, large populations of ducks, geese, and wading birds and 6.6 waterfowl nests found per acre of vegetation in 1950. From 1952 through 1955, drought, combined with intensive over-grazing by cattle, severely

reduced bird populations. Duck nests dropped from 6.6 to 2.7 nests per acre of vegetation.

e. Upland Game Species

Habitat for upland game species is extremely limited within the existing Refuge boundary. Two species have been recorded on the Refuge, the sage grouse and the ring-necked pheasant. The sage grouse is listed as rare, and little will be done to increase its numbers on the Refuge, as habitat is not available either on the existing Refuge or the proposed acquisition area. Much could be done, however, to ensure the increase of the ring-necked pheasant. The proposed acquisition would provide a great deal of habitat for this species both within the wetland complex and on the uplands. This species had shown a dramatic drop in population numbers throughout the state in the last thirty years due to losses of both nesting and wintering habitats.

f. Passerine and Other Species

Ninety-six species have been recorded in the area, of these, nineteen have been known to nest.

5. Mammals

Many mammals common just outside the Refuge are rare in the marshland habitat. There have been 31 different species documented as using the Refuge. By far, the largest number of individuals occurring on the Refuge are rodents that burrow in the banks and hurry through the vegetation in their quest for food and shelter. A list of mammals identified as using Bear River Migratory Bird Refuge is included in Appendix F.

a. Endangered/Threatened Species

There are no known endangered or threatened mammals using the Refuge or proposed acquisition.

b. Furbearers and Predators

Furbearers are generally those species whose populations are managed by wildlife agencies for their commercial market fur value. Historically, these populations were a source of livelihood for early explorers of the region and ultimately led to settlement. Today, furbearers, at best, provide supplemental income, but for the most part, are a source of hunting and trapping recreation. Muskrat are by far the most important furbearers on the Refuge. Trapping began in 1931, and with the exception of two years, continued through

1984. Over 217,000 muskrats have been taken off the Refuge during that period with a high of 10,600 in 1974.

c. Big Game Species

Big game species are not an important part of the Refuge. An occasional mule deer may wander onto the Refuge from the surrounding area, but does not stay for any period of time. Tracks are observed fairly often in the northwest portion of the Refuge, and occasionally, deer have been noted in the farm land area and eastern edge of the proposed acquisition.

d. Small Game Species

The only species under this category is the cottontail rabbit whose numbers have never been plentiful on the Refuge area.

G. Botulism

While not specifically mentioned in the Congressional Act that sets aside the Refuge, one of the principal reasons for establishing Bear River Migratory Bird Refuge was to prevent "Western Duck Sickness" or botulism.

The first die-off of birds was first noted in literature in 1909, and was thought to be caused by alkali poisoning. Many thousands of waterfowl, marsh, and shorebirds have died of botulism over the years. Restoration and management of the marshes were thought to stop or slow down the disease which seemed to occur every year. This prompted many conservationists and sportsmen to petition the government to establish the Refuge in an attempt to stop the plague that was depleting waterfowl populations. However, establishment of the Refuge did little to slow down the death toll of migratory water birds.

Twenty years elapsed between 1910, when "Western Duck Sickness" became generally recognized as a serious menace to aquatic birds, and 1930, when the publications of Kalmbach and Giltner and Counch presented conclusive evidence that the disease was a form of botulism. In an effort to learn more about the disease, a research laboratory was established on the Refuge in 1936 to study the cause and to work toward a cure. Although their investigations left no doubt that the

disease resulted from ingestion of the toxin, Clostridium botulinum type C, 60 years later, the substrate utilized by the bacterium for growth and elaboration of toxin under natural conditions is not certain. Three factors contributing to botulism development include: 1) lowered water levels during hot summer months, 2) an abundance of flies, and 3) animal carcasses for toxin production. Studies from the Bear River Research Station have shown that most birds suffering from botulism can be saved. Fresh water and shade may be all that is required to save birds in early stages of the disease. Injecting birds with antitoxin can result in recovery of over 75 percent of the birds; however, capturing and treating sick birds with antitoxin is costly. In dealing with avian botulism, the emphasis should be on prevention and control of outbreaks, rather than treatment of poisoned birds. Identifying possible cases of avian botulism at early stages is the key to effective control. (Friend, Locke, and Kennelly, 1985).

David H. Madsen wrote the following about his work with botulism:

> "It was mid-September 1910 when a small army of men entered the marsh to pickup dead ducks. What a job it turned out to be! A few ducks had died the year previous, but not enough to cause any great comment. The first reports of dead birds reached the office sometime in August, but it was the middle of the September before we went into the marshes. We paid no attention to the sick birds, of which there were thousands, our efforts were confined to gathering all the dead ones which we piled up and burned. Although the facts will never be known, I think it safe to say that nearly two million birds perished that year in the Utah marshes. It was estimated by many sportsmen that between fifty and eighty-five percent of the ducks which came to the Utah marshes that year had perished. Every species of waterfowl or shorebird which frequents the marshes was effected. During the years that followed there was considerable loss of birds each fall. The year of 1914 was also a very bad year with great losses. During the period 1916 to 1920 the disease occurred each year, but the losses which were experienced in 1910 and 1914 were not again equalled during that period. During the period from 1921 to 1928 no serious losses have occurred." (Madsen, 1929.)

George E. Mushbach, the first Refuge Manager, stated:

> "1929 was a bad year, anywhere from 100,000 to 200,000 ducks had died at the mouth of the Bear River. In 1927, the Saturday Evening Post, carried an article on duck sickness in the Bear River section and stated that over a period of a few years something like seven million ducks had died in the vicinity of what is now the Bear River Refuge. In 1930 about 75,000 birds died on the Refuge proper, but from 100,000 to 200,000 died in the Willard Bay section." (Mushbach, 1930.)

TABLE 2. BOTULISM LOSSES FROM 1931-1989 BEAR RIVER MIGRATORY BIRD REFUGE

Year	Birds Lost	Year	Birds Lost	Year	Birds Lost
1932	33,000	1948	2,700	1964	2,100
1936	2,000	1949	4,200	1965	20,000
1937	10,000	1950	22,000	1967	15,000
1938	5,000	1951	14,800	1970	2,300
1939	14,000	1952	28,200	1971	40,000
1940	20,000	1954	2,000	1975	5,000
1941	7,000	1955	17,000	1979	15,000
1942	20,500	1957	4,600	1980	55,500
1943	2,300	1958	12,100	1981	5,100
1944	3,800	1960	2,400	1982	22,200
1945	17,000	1961	3,000	1983	20,000
1946	7,200	1962	5,800	1984	3,300
1947	3,000	1963	43,200	1985	2,000

H. Archeological, Cultural, and Historical Resources

1. Prehistory and Archaeology

The cultural history of the Great Salt Lake wetlands follows the broad outlines of prehistory for Utah. However, the concentrated

resources of wetland habitats along the eastern margin of the Great Salt Lake, including waterfowl, fish, mammals, and numerous plant resources, combined with access to upland resources nearby, contributed to the development of a lifestyle somewhat different from those in more arid portions of the Great Basin. The difference has long been recognized as being one favorable for intense aboriginal occupation of wetland environments. While it is clear that wetlands were inhabited throughout Utah's prehistory, many features of these systems remain poorly understood, including season of occupation, duration of occupation, degree of mobility, the relative use of upland versus wetland habitats, group size, and the role of agriculture during particular period. (Simms and Stuart, 1989.)

2. Recent History

Historical records for the Great Salt Lake region show the Shoshone as the principle inhabitants, but indicate occasional visits and/or raids by Ute, Blackfoot, and Flathead Indians. Shoshone inhabitants include northwest Shoshone groups occupying the Promontory Mountains (Hukunduka, or seed eaters) and the "Weber Utes" (Cumumbahs). It is also known that Northern Shoshone and Bannock from Idaho and Eastern Shoshone from Wyoming were also frequent visitors to the area, with much interaction among the bands of all these named groups.

The first historical reference to the Great Salt Lake region comes from the journal of the Dominquez-Escalante Expedition of 1776. They observed Ute groups, without horses, living in substantial villages near Spanish Fork in Utah County. At that time, the Utes were afraid to hunt the lands to the north because of horsemounted Shoshone living in little houses of canes and earth around the Great Salt Lake. This report was followed by the 1813 journal of Astorian Robert Stuart, who reported that the Shoshone in the Bear River delta had few horses or firearms and were terrorized by Crow and Blackfeet raiders pushed from their normal ranges by Euro-American expansion. These groups plagued the Shoshone in the Great Salt Lake area until the Shoshone joined forces with the trappers in the 1820's. French, British, and American trappers all competed for the rich yield of furbearing animals in the area until the late 1830's. (Simms and Stuart, 1989.)

The first white men to explore the area were fur trappers. Weber's party, of the Rocky Mountain Fur Company, trapped beaver in the winter of 1824. Jim Bridger, a member of this party, followed Bear River to the Great Salt Lake. When he tasted the water, he thought he had discovered an arm of the Pacific Ocean. John C. Fremont and party were the first white men known to have explored any of the islands of the Great Salt Lake.

The abundance of wildlife in the Great Salt Lake wetlands invoked this comment from the explorer John C. Fremont in 1843:

> "The whole morass was animated with multitudes of waterfowl, which appeared to be very wild rising for the space of a mile round about at the sound of a gun, with a noise like distant thunder. Several of the people waded out into the marsh and we had tonight a delicious supper of ducks, geese and plover". (Fremont, 1845.)

In addition, Fremont observed a family of Shoshone fishing at the mouth of the Bear River with "several weirs or nets which had been rudely made of canes and rushes." Late in the summer, he also observed Shoshone in the marshes trapping fish and reported that the Indians living in these marshes moved in clusters of two to ten families. (Fremont, 1845.)

Captain Howard Stansbury, sent to map the region in the late 1840's, echoed Fremont's awe of the abundance of resources in the wetlands. He also reported the presence of many prehistoric sites in the area.

Another great transition is marked by the arrival of the Mormon pioneers in the late 1840's. These settlers again brought farming to the region and, by the 1850's, were appropriating the vast grasslands nestled between the Great Salt Lake and the mountains, farming the higher ground, away from the lake, and grazing many animals on those lands nearer the lake.

In 1851, eight families gathered in the settlement that is now known as Brigham City. Three years later, Lorenzo Snow and his colony of 50 families settled in this area. During the next few years, many of the small communities in the valley were settled.

An event that accelerated colonization of the entire west was the completion of the transcontinental railroad with the driving of the "Golden Spike" on May 10, 1869, at Promontory Summit just west of the Refuge.

Many early pioneer journals document Shoshone collecting fall seeds and waterfowl from the Great Salt Lake marshes on a seasonal basis through the early 1900's.

The early part of the 20th century was a bonanza for duck hunters who could shoot and sell over 300 waterfowl a day to markets in many states. One hunter, Frederick Wilson, reported shooting about 3,000 waterfowl during the 1905 season, selling them for $3.00 per dozen. It was during this period also that many of the private hunting clubs sprang up in the area, perhaps the best known of these being the Bear River Club. The marshes of the Great Salt Lake and the Refuge have a long tradition being some of the finest hunting areas to be found in the United States.

I. Land Use

1. Location and Size

Bear River Migratory Bird Refuge is located in northcentral Utah on the eastern edge of Box Elder County. The county is one of the largest in Utah and has a total acreage of 3,580,160 acres. Of the total acreage, 1,383,320 acres are owned by public agencies and 2,196,840 acres are in private ownership. The county seat is Brigham City, and the other major communities include Tremonton, Garland, Honeyville, Deweyville, Corinne, Bear River, Snowville, Willard, Perry, and Mantua. The county carried an estimated population of 36,800 individuals in 1986, with 95 percent living along the eastern edge of the county. County growth has averaged 1.6 percent over the past ten years, and is expected to continue for the next several years.

2. Land Use and Ownership Patterns

Approximately 39 percent of the land in the county is under public ownership, with the Bureau of Land Management being the largest holder of public lands; other agencies include: U.S. Fish and Wildlife Service, U.S. Forest Service, and National Park Service. There are also "school sections" and approximately 6,800 acres in State-management hunting units and the Willard Bay State Park.

3. Transportation and Access

a. Highway System

The Brigham City area is serviced by several major highways that provide primarily north-south access. Interstate Highway 15, located just west of town and paralleling the eastern boundary of the proposed acquisition area, carries traffic between Salt Lake City and the Pacific Northwest. Just north of the Refuge, Interstate Highway 84 breaks off from I-15 and carries traffic to the Boise, Idaho area. U.S. Highway 89 travels east from Brigham City carrying traffic toward the Jackson Hole/Yellowstone National Park area. At the northern edge of Brigham City, State Highway 83 heads west to the Thiokol site, while State Highway 504 leads to the Golden Spike National Historic Site. There are a series of well kept state highways that allow easy access to other points of interest within the area. Access to the Refuge would be off Interstate Highway 15. A county road providing access to hunting clubs and the old Refuge headquarters area is located in the northern portion of the Refuge. Refer to the vicinity map for the location of these highways.

b. Air System

No commercial air service is available in Box Elder County. Aircraft flights over the Refuge area do not pose any problems.

c. Rail System

The Union Pacific Railroad's main line passes through Ogden, 30 miles south of the Refuge and provides Amtrack service to the east and west coasts. There is a spur line which provides freight access, and runs north from Ogden into Brigham City. Rail traffic would have no effect on the Refuge area.

4. Utilities and Facilities

One major electrical transmission line, operated by Pacific Power and Light Company and Utah Power and Light Company traverses a portion of the proposed Refuge acquisition and the area just east of the Refuge. Most residential and commercial power users are serviced by Utah Power and Light, which has responsibility for the distribution feeder line and lateral lines in the area. Brigham City has its own municipal power operated by the Brigham City Corporation. No data is available on possible waterfowl/ transmission line interactions.

Telephone facilities are operated by U.S. West Communications, American Telephone and Telegraph and other long distance operators. Natural gas in the area is provided by Mountain Fuel Supply Company. Most power, gas, or other utility systems are placed in corridors that are acquired as easements super-imposed on existing ownerships and few exist on the Refuge.

J. Socioeconomic

1. Population Structure

The early inhabitants of the region were desert- culture Indians who lived on seeds, roots, berries, and small game. Indian caves on the southern side of the Promontory Mountains remain to this day. The Navajo were some of the first, but Shoshone and Ute later occupied and used this area as a hunting ground. In the early 1800's, the area was extensively used by trappers and fur traders and colonized by the Mormons in the mid-1989's. In 1851, eight families gathered in the settlement now known as Brigham City and three years later, Lorenzo Snow and his colony of 50 families settled here. During the next few years, many of the small communities in the valley were settled. Agriculture was the initial industry and continues to be a mainstay. With the completion of the transcontinental railroad in 1869, the first influx of non- Mormons arrived and were associated with the railroad town of Corinne. The railroad and major highways provide ready access to outside markets and the area currently has several small industrial manufacturers.

The Mormon emigrants strongly influenced the cultural and social structures of the area, which remain strong but are mixing with new attitudes and lifestyles. The more traditional living patterns are maintained to a greater degree in less populated, rural areas and small communities of the area.

The town of Corinne experienced rapid population growth in the 1870's as the railroad continued to be an important aspect of the area. When the cut-off across the Great Salt Lake was completed and the northern loop around the north end of the Lake cut off, the population dropped back to that of a small farming community. The next boom to the economy and growth of the area occurred in the early 1940's with the construction of the Bushnell Army Hospital in Brigham City. This complex was later converted to the Intermountain Indian School, and is now the Brigham City

industrial park. The last major influence on the area was the construction of the Morton-Thiokol plant for the building of rocket booster engines used by the military and the U.S. space program. Population growth since then has been rather slow and for the most part. The population in Box Elder County has grown from 28,129 in 1970, to 33,212 in 1980, and the last estimate in 1986 showed 36,800 persons. A stable growth rate is predicted for the future.

2. Local Economy and Labor Analysis

In terms of total earnings, the principle industry of the area is manufacturing, followed by government, services, retail trade, construction, and farming. Non-farm income amounted to $459.6 million and farm income $12.4 million in 1987. The population of the area in 1987 was broken down as follows: 14,750 under 17 years of ages, 18,800 persons 18 to 64 years of age, and 3,250 persons 65 years of age or older. These figures coupled with land availability, adequate water resources, and a low tax base provide an ideal outlook for future growth and represent a stable work force for the future. Unemployment in the area is under 3 per cent, well below the state and national averages.

Thiokol Corporation is the largest single employer in the area with a work force of over 8,000 employees, many of them highly skilled technicians. Other nonagricultural employers include construction (445 employees), manufacturing (2,480 employees), services (1,150 employees), and government (1,855 employees).

3. Government Structure, Taxes, and Controls

The regulatory government structure is at the county level. Brigham City is the county seat. Government is by Commission with three elected Commissioners, one of whom serves as Chairman. Commissioners meet weekly in the Commissioners room of the Box Elder County Courthouse.

a. Land Regulation

Land Use is regulated through the Box Elder County Office of Planning and Development, which administers and coordinates Planning and Zoning Commission activities. The Box Elder County Land Plan provides the guidance for land development activities in the county.

b. Taxes

The major sources of State and county revenue are property taxes (the largest source of income), corporate and individual

income taxes, and sales taxes. The State sales tax rate is 6 percent. Some components used in the production of new articles, some agricultural purchases, and sales to governmental units are exempt from sales taxes.

Property tax rates are set by the County Commission and collected by the County Treasurer. In addition to property and sales taxes, the county also receives revenues from the Federal agency land holdings in the county in the form of payment-in-lieu-of taxes (PILT). Various formulas are used to compute PILT according to the uses made of the Federal lands.
See Appendix C.

4. **Agriculture/Ranching**
The economy of the Brigham City area is dominated by its agricultural base. The farms, ranches and fruit orchards in the vicinity of the Refuge and proposed acquisition are almost all individually owned and operated. Irrigated cropland on the higher areas provide the main source of income for the agricultural community. The lower, wetter areas are utilized to an extent for cattle grazing.

5. **Recreation and Travel**
Recreation and tourism in Box Elder County are well known throughout the State. Attractions are listed in the Utah Travel Guide under "Golden Spike Empire." The Cache National Forest also has publications on recreational activities and information is readily available on recreational and scenic sites in the adjacent locale.

General outdoor recreation activities are fairly well dispersed throughout the area. Five State Parks are available within less than an hour's drive from Brigham City, with Willard Bay State Park adjoining the Refuge on the South. Perhaps the greatest natural attraction is the Great Salt Lake where sunsets may be viewed from several locations. Inspiration Point on 9,764 foot Willard Peak, which can be reached with a 4-wheel drive vehicle, has panoramic views of the lake and Refuge. Fall colors and wildflowers are vivid in the Sardine Canyon east of Brigham City and Ogden Canyon east of the Monte Cristo area. Hiking and backpacking, jeep trails, and horseback trips are available in areas of the National Forest located along the east side of the

area. Downhill skiing is available at three ski areas, with many crosscountry skiing and snowmobiling trails available. Water sports are available at numerous locations, with Willard Bay and Bear Lake State Parks receiving perhaps the greatest use, although there are many other reservoirs available in the area for water sports. There are two natural hot springs resorts: Belmont Hot Springs Park has the largest natural flow of mineral springs in the western United States; Crystal Hot Springs is located just 10 miles north of Brigham City. Waterfowl hunting in the marshes of the Great Salt Lake and big game hunting in the mountainous areas have long been popular recreational activities. Fishing is also popular both in flat water and in streams. There are several historical sites and buildings within the area. The Golden Spike National Historic Site is located 32 miles west of Brigham City and several nearby towns have historical buildings.

The interstate highway through Brigham City is a main artery to the Northwest United States and a major junction where the road splits off and goes north into the Jackson Hole and Yellowstone National Park area.

Long known for its waterfowl hunting, the area has five State Waterfowl Management Units and numerous private hunting clubs. However, Refuge and State figures indicate a drop in waterfowl hunting over the past several years--waterfowl populations have decreased and hunting costs have increased. In the early 1950's, the Refuge had just over 5,000 hunters per year; the average, however, dropped to around 3,000 hunters per year in 1983. Figures from the Department of Natural Resources show a similar decline for areas under their management.

Visitor use at Willard Bay State Park has been somewhat erratic, but has averaged better than 24,000 for the past ten years. Bear Lake State Park, located on the north end of Bear Lake, has an annual visitor use of 71,700. The visitor use for Idaho's Bear Lake State Park has increased by 15 percent in the last couple years. In Utah, usage for the Bear Lake facilities amounted to approximately 284,000 visitors in all the park areas. Visitation figures for the Bear Lake facilities in Utah are: Bear Lake East - 56,014, Bear Lake Marina - 134,619, and

Rendezvous Beach State Park - 103,551. Revenues derived from park facility use in the Utah State parks at Bear Lake have been steadily increasing from $123,804 in the 1982/83 year to $212,000 in the 1987/88 year. (Utah Dept. of Natural Resources.)

6. Development Trends

Employment in construction and manufacturing are expected to increase dramatically (67%) by 2010. All other sectors, except agriculture and mining, are also expected to show significant growth. (Agriculture is expected to grow only 2.4 percent and mining will show no growth.) Transportation, Communication, Public Utilities, trade, Finance, Insurance, and Real Estate, and Services will show around a 40 percent growth, while Government will show a 23 percent growth. (Utah Office of Planning and Budget, November 1989.)

V. ENVIRONMENTAL CONSEQUENCES

Introduction

This section evaluates the environmental impacts that can reasonably be expected to result from each of the Service's alternatives for rehabilitation and expansion of the Bear River Migratory Bird Refuge. The impacts described include those to physical and biological resources as well as the socioeconomic structure of human resources. The relative significance of the impacts are discussed in terms of magnitude, duration, and likelihood of occurrence. The relationship of these impacts to federal, state, and regional programs are discussed where relevant.

The primary impacts of the proposal are:

- Perpetual protection for wildlife and wetland values.
- Loss of land ownership by the private sector and displacement of some families.
- Enhanced waterfowl and other wildlife populations.
- Increased tourism and public use benefits in Box Elder County.

During review of the Refuge proposal, and as a result of public input, the following issues were defined:

- Wildlife/Wildlands Protection and Management
- Local and Regional Economics
- Tourism and Recreation
- Agricultural Practices

- Water Resources and Water Rights

Discussion of consequences of each alternative will focus on aspects of these major issues.

The proposed management consequences are displayed in summary form on the following page. Appendix A is a list of outputs available under each alternative with details on management objectives.

A. No Action Alternative Impacts

The No Action Alternative would result in the Refuge reverting to an appearance preceding development. Existing dikes and water control structures would slowly deteriorate and with the passage of time, all signs of man's presence would disappear. The natural wetlands associated with the Bear River delta would attract waterfowl, associated waterbirds, and other migratory birds. Service presence would be limited to posting the Refuge boundary and protecting natural resources. Most public use of Refuge lands and waters would cease. No private lands would be purchased or easements taken. Expected impacts would occur strictly as a result of actions by the private sector or other public agencies.

1. Effects on Wildlife/Wildlands Protection and Management

Impacts on fish and wildlife resources would arise from several sources in this alternative. Marsh habitat would be reduced greatly as the Refuge would no longer be managed actively, this would affect all species of wildlife, particularly waterfowl using this type of habitat. Current grazing and agricultural practices on the proposed acquisition would continue to impact wildlife negatively. Loss of habitat and predation would continue to be a major factor in limiting waterfowl production on the existing and proposed Refuge expansion. A great deal of water and shorebird habitat would be lost, resulting in a decline in these species.

Botulism might be reduced in the immediate vicinity of the Refuge, but would probably increase in areas outside the present boundary since waterfowl use would shift from the Refuge to other areas.

The Service would be unable to assist in meeting the goals of the InterMountain Joint Venture of the North American Waterfowl Plan.

Annual use by endangered species and species of concern would drop from 305,000+ to approximately 6,000 use days. Waterfowl production would drop approximately 95 percent and waterbird production would drop 50 percent. Waterfowl use would drop from 16,500,000 to 4,800,000 use days, and shore, marsh, and water bird use will drop from 15,000,000 to 2,500,000 days.

Much of the marsh vegetation on the Refuge would die out as impounded water recedes. The only remaining vegetation would be located along the water ways where the Bear River flows through the Refuge. It is estimated that 10,000 acres of marsh vegetation will become mudflats with limited vegetative cover due to lack of water flow.

Most privately owned marsh habitat proposed for acquisition would continue to be managed as it is presently. Cattle grazing at present stocking rates will continue to have adverse impacts on the marsh vegetation in the proposed acquisition area.

All impacts to vegetation from this alternative are reversible or retrievable. Improvements in grazing management and enhancement of existing upland and wetland vegetative cover can be achieved if existing water rights remain.

2. **Effects on Local and Regional Economics**
   a. **Population Structure and the Human Environment**
   There would be no significant impacts on the local population levels as a result of the No Action Alternative. The population of Box Elder County is expected to show an annual rate of growth of 1.2 percent. (Utah Office of Planning and Budget).
   b. **Local Economy and Labor Analysis**
   In a "No Action" condition, the economy of the Box Elder County would not be affected by the Service. The principal industry is manufacturing, followed by government, services, retail trade, construction, and farming. The largest single employer is Morton Thiokol with 8,400 employees. Conditions appear to be good that the local economy and labor force would remain strong.
   c. **Government Structure, Taxes and Controls**
   No significant impacts are expected on governmental entities as a result of this alternative. Local taxing structures and land use regulations would continue to apply to residents. Refuge

Revenue Sharing payments would continue to the county on Service-owned lands. This would amount to $12,000-$16,000 per year.

3. **Effects on Tourism and Recreation**
The No Action Alternative would impose a negative impact on local recreation and travel income sources. The reduced flow of tourism traffic to the Refuge would result in a significant loss of money otherwise available to the local sector. However, other recreational sites in or near the area would continue to draw some recreational and tourism traffic.

Wetlands could continue to be sold to private interests for hunting and/or other recreation. There would be few recreational opportunities for the general public on the Refuge. No public access would be guarantied on the private lands now targeted for acquisition.

No public use facilities would be developed and the only recreational use would be those that occur without the benefit of provided facilities. Recreational use would drop from over 18,000 visits to just over 5,000 visits.

4. **Effects on Agricultural Practices**
Few impacts would occur to agricultural practices. Land ownership patterns would remain as is, subject only to changes within the private real estate market. No landowners would be displaced since no more lands in Box Elder County would be placed in public ownership.

5. **Effects on Water Resources and Water Rights**
Water management activities by the private sector would continue under state water law and the Bear River Compact. Any exercise of water rights under state regulation would be at the discretion of the current landowners. The Service would have little in the way of water management capabilities since facilities would not be rehabilitated. Existing water delivery systems are badly silted in and water control structures are heavily damaged.

Refuge water rights would not be put to beneficial use; therefore, the Service would possibly lose the current 1,000 cfs water rights they now hold.

Water quantity or quality in the Bear River would not change. However, increased siltation would decrease water quality if more private marsh habitat is grazed or disturbed by other agricultural practices.

Refuge water rights would not be used effectively and much of the Bear River would flow temporarily into the Great Salt Lake, put to some other use due to other water filings.

If Refuge water rights are lost due to non-beneficial use, these rights would probably never again be available for the Service to file upon for wildlife uses. As a result, over 23,000 acres of fresh water marsh habitat could be lost forever.

Conclusion

Short-term impacts on the wildlife populations would occur immediately and result in long-term impacts if the conditions remained as they are. Grazing impacts on the proposed acquisition could be long-term if management practices eliminate marsh vegetation, or they could result in different successional stages in plant communities. Vegetation would continue to be negatively impacted by the lack of water control on the existing Refuge. Current grazing practices on the proposed acquisition area would change marsh habitat vegetation over time. There would be few adverse effects upon local or regional economics. Visitor use of the Refuge would decrease. No public use facilities would be provided on the Refuge. Some hunting and fishing would occur. Recreational hunting would be adversely impacted and limited to certain special interest groups willing to pay for hunting on private clubs. The benefits of private land ownership would be perpetuated. The No Action Alternative could result in significant impacts upon the Service water rights. Competition for unused water would accelerate. The Alternative would not greatly affect socioeconomic resources. Some negative impacts can be shown to exist due to loss of tourism dollars to the local economy.

B. Restoration Alternative Impacts

This alternative would allow the Service to take action to restore the Refuge to the condition that existed prior to the flood damage. However, no permanent buildings (Refuge office, visitor center, shop, etc.) would be constructed because all Refuge lands are in a designated flood plain. Federal law prohibits such construction unless

development can be fully protected from future floods. All existing dikes and water control structures would be repaired and maintained. Migratory bird use would return to a level similar to that before the flood and follow the same trends. Public use would be reduced because of the loss of the visitor center. Primary activities would be hunting, fishing, and bird watching. An auto tour route would be developed, but would have limited interpretive facilities. There would be no Service acquisition of private lands or easements.

Several possible impacts under this alternative would be identical to those experienced of the No Action Alternative. The major difference being that Refuge wetlands would be restored, and active water management would be carried out. Discussion of impacts will be directed toward those that vary from the previous alternative.

1. **Effects on Wildlife/Wildlands Protection and Management**

   Wildlife would benefit with the restoration of the marsh. Bald eagles, an endangered species, would increase use days from 900 to 6,900. The snowy plover and the white-faced ibis, both species of concern, would increase in both production and use days. Snowy plover production would be approximately 50 young, with 2,000 use days; white-faced ibis production would be about 450 young, and use days would amount to approximately 297,500. Waterfowl and water and shore birds would return in numbers similar to those prior to the flood. Waterfowl production would be 14,000 birds. Water and shore bird production would double from the "No Action Alternative" to 4,000 young. Waterfowl use days would be approximately 16,500,000, with water and shore bird use days averaging 15,000,000. The same problems prior to the flood would remain, namely: lack of upland nesting habitat for waterfowl, potential for nest flooding in the spring, and inability to manage water resources to prevent or stop disease outbreak when it occurs. Great numbers of migratory birds would continue to be lost to botulism. Wildlife populations would not achieve optimum levels.

   Although wildlife populations would rebound to pre-flood numbers through the restoration of the Refuge water management facilities, long-term productivity of the area would continue declining as it has for the past twenty years. Refuge records document a decline in all categories of wildlife outputs during this period.

The Refuge would be able to meet some commitments to the North American Waterfowl Plan.

Marshland habitat and vegetation would be returned to the preflood condition. It is anticipated that there would be a short period of perhaps five years following the commencement of management when the marshes would show an increase in productivity, but in the long term, the marshes would continue deteriorating as they have over the past 20 years due to inadequate water management capabilities and less than optimum vegetative diversity.

2. **Effects on Local and Regional Economics**
The Restoration Action Alternative would have limited impact upon the local socioeconomic resources. Increased Refuge staff would provide approximately $150,000 as a result of salaries and operating expenses. Approximately $4,000,000 would be needed to restore the Refuge, an amount that would be spent in the area. No additional lands would be purchased and the Refuge would continue paying the county the Federal PILT as it has in the past.

3. **Effects on Tourism and Recreation**
Recreational use of the Refuge area would be minimal, since no recreational use facilities or visitor center would be available. The old tour route around Refuge Unit 2 would be reopened, but there would be limited interpretive information. Waterfowl hunting would also increase over the No Action Alternative to numbers similar to those prior to the flood. The Refuge could expect around 14,000 visits per year. The Refuge would have little to attract or increase tourism, except naturally occurring features.

4. **Effects on Agricultural Practices**
Land use would be the same as those described in the No Action Alternative.

5. **Effects on Water Resources**
Refuge water rights would benefit the area's water resources by creating approximately 27,000 acres of marsh habitat. Water flowing into State lands south of the Refuge would continue as in the past. Efficient use of the water resources on the Refuge would remain a problem, as would early spring flooding. No additional water rights would be obtained.

Conclusion
Wildlife would benefit from the restoration of the Refuge habitat, but optimum conditions would not be reached and full population potentials would not be achieved. Botulism would continue to be a major problem with large numbers of birds dying annually. Short-term effects would be the reestablishment of the marshland type vegetation. However, due to the inability to effectively manage the resource, the long-term effect would be a decline in the quality of the vegetation and the marsh habitat. Vegetation would be enhanced through the use of Refuge water rights, but conditions would not be at optimum levels due to inherent problems with the current Refuge facility design. Overall conditions in the Great Salt Lake marshes would be improved. Increased Refuge activities would provide limited economic benefits on both the short- and long-term basis. Limited long-term demand for recreational use of the Refuge would not be generated, and long-term potentials for wildlife oriented recreation would not be achieved. Water management to reduce the chance of botulism outbreaks would not be possible, and large numbers of wildlife would die annually.

C. Enhancement Action Alternative Impact

The Enhancement Alternative would allow the Service to intensively manage existing Refuge lands for migratory birds. Refuge management in the 1980's demonstrated that subdividing large impoundments provided higher quality marsh habitat and better use of existing water supplies. The five units currently existing would be subdivided into 23 smaller units. Additional "check" dikes would be placed on the south boundary to create marsh habitat in those areas before the water is released. The major water diversion canals would be constructed to accommodate excess spring flows through existing Refuge lands and right-of-ways. The canals would carry excess spring flood water from Bear River and allow better control of carp and water and marsh conditions. An increase in upland nesting type habitat would be provided for waterfowl. Most waterfowl species would benefit, but shorebirds and fish-eating birds may experience a slight loss of habitat. Public use activities would focus on hunting, fishing, and bird watching. An auto tour route similar to the one described in the previous alternative will be developed. No public lands would be acquired or easements executed. Discussions of impacts would be directed toward those that vary from the No Action or Restoration Action Alternatives.

1. **Effects on Wildlife/Wildlands Protection and Management**
All marsh and wetland species would benefit from increased habitat. Waterfowl would be provided with upland nesting habitat. Other species using this type habitat would increase production by an additional 5,000 birds per year. With the increased upland nesting habitat, predation problems on nesting birds would be greatly reduced. Improved emergent marsh habitat would increase overwater nesting species production by an additional 3,000 birds (mainly redheads and ruddys). Endangered species use would not change from the Restoration Alternative but white-faced ibis would have an increased production of 650 birds and use days would increase by 59,000. Shorebirds would not benefit greatly from the management practices of this alternative, but water bird production would increase by 1,000 young. Shore, marsh, and water bird use days would increase by 2,000,000. The Refuge would be an active participant in the conservation community in meeting the objectives of the Inter-Mountain Joint Venture of the North American Waterfowl Plan. Waterfowl and water bird losses to botulism probably would be greatly reduced. Large fish would be eliminated from the Refuge impoundments through the use of fish screens and water manipulations, but small fish would remain as a food supply for pelicans and other fish-eating birds. Due to a stable habitat, muskrats would increase to about 18,000.

Improved vegetative cover and diversity of habitat would result from improved water management. Although no additional marsh habitat would be provided, there would be a change in acreage of certain vegetative types. The largest change would occur on 8,500 acres of mudflats converted to alkali bulrush/salt grass habitat in the northern end of Units 1, 3, 4, and 5. Vegetative types may be varied due to water depths. Additional upland habitat would be possible also. Shallow water habitat may allow intrusion of unwanted species, such as salt cedar.

2. **Effects on Local and Regional Economics**
This alternative would have some impact on socio-economic resources. There would be no additional land purchases. There would be increased government funds spent in the area on construction of new dikes and water management facilities, which would amount to an estimated $4,000,000. With the addition of four Refuge employees, salaries and routine operating expenses would add approximately $250,000 to the local economy.

3. **Effects on Tourism and Recreation**
Tourism and recreation would be similar to that of the Restoration Alternative, except for increases in visitors using the auto tour route and in both waterfowl and upland game hunting. Tour route visitation would increase by 3,000 visits, waterfowl hunting by 1,600 visits, and upland game hunting by 200 visits.

4. **Effects on Agricultural Practices**
Land use would be no different than those described in the two previous alternatives. Surrounding lands will not be affected.

5. **Effects on Water Resources and Water Rights**
No new water rights would be acquired under this alternative. With improved water management capabilities, the Service would be able to use water more efficiently by utilizing a system of flow-through units. This allows independent management of each marsh unit. Not all units would be filled within a given year. Major water diversion canals would pass excess, high spring flows through the Refuge, reducing flooding.

The Refuge would consume 270,405 acre feet more water than it would under the Restoration Alternative creating an additional 8,500 acres of marshland and leaching the newly created marshes at least two times per year.

Water quality in the marshes would be adversely affected during construction, since bare soils increase siltation. This would be a short-term effect, however, dikes and islands would be reseeded as soon after construction as possible.

Conclusion
Improved marshland habitat resulting from better water management would improve all wildlife populations. Creation of additional wetland habitats would result in long-term benefits to waterfowl and wetland-associated species. Disease control is possible. Both submerged and emergent vegetative species would benefit from the removal of large carp from Refuge impoundments. Unwanted vegetative species may invade some shallow water habitats. Local and regional economies would benefit from increased construction funding and Refuge operational funding. No new land purchases would be undertaken. There would be only a slight increase in tourism and recreational visits, and no change in agricultural practices. Increased

water management options would be available, resulting in more efficient use of water. Refuge flooding from the Bear River would be eliminated through use of major water diversion canals. Marshland habitat would be improved, and the botulism problem would be greatly alleviated. Short-term water quality problems would be experienced during the construction phase.

D. Expansion Alternative Impacts

This Preferred Alternative by the Service proposes expanding the Refuge boundary through land acquisition of 38,200 acres. This action allows for intensive wildlife and public use development and protection of wetlands situated outside the present boundary. The additional lands are located primarily north and east of the Refuge. Two types of land acquisitions are proposed: fee title - 16,891 acres and long-term easements - 21,309 acres. Lands to be acquired in fee title lie south of the Bear River and Forest Street and would be the area of new development.

Six new impoundments would be created with 17.5 miles of diking. The Refuge would be divided into approximately 29 units, each with individual water management capabilities. A canal and drain serving each unit would allow efficient water management, which would meet the needs of the entire marsh community. The water would be used several times as it moves through the Refuge and a variety of habitats would be created. With the canal system in place, excess spring flows would be by-passed through the Refuge directly to the State-managed area to the south. Additional water rights would be used to improve the habitat acquired in fee title to the south of Bear River and Forest Street.

Few physical changes are anticipated in the natural marsh area on the east side of the fee purchase area.

Part of the purchased land would be above the established flood plain, allowing for the construction of buildings and visitor facilities. Major developments include additional impoundments, an administrative complex and visitor center near Highway I-15, two auto tour routes (20 and 8 miles), nature trails, and an environmental education center.

Wetlands north of Bear River and Forest Street would be protected through the purchase of perpetual easements. All land acquisition, fee and easement, would be accomplished only through a willing-seller basis. Some private lands in the fee purchase area would be removed from tax rolls and placed in government ownership. Up to seven families may be displaced. Grazing would likely be reduced in the fee purchase area.

1. **Effects on Wildlife/Wildlands Protection and Management**
   The intent of the Service's proposed action is to provide the land base necessary to achieve optimum conditions for wildlife species management. The following would benefit from this alternative:
   a. **Endangered Species** (Appendix A-5)
      Existing populations of bald eagles would benefit from the enhanced habitat for feeding, and use days would increase by approximately 2,800. Peregrine falcons would be encouraged to nest near the Refuge area, with an additional 150 use days anticipated.
   b. **Species of Concern**
      Habitat would be managed to encourage ibis rookeries. At least two new rookeries are anticipated increasing production by more than 2,000 young per year. Ibis use is expected to increase by 80,000 use days per year. Managed habitat for the snowy plover could double production to approximately 100 young per year while increasing use days by 1,500.
   c. **Waterfowl** (Appendix A-7)
      The Refuge would work within the framework of the InterMountain Joint Venture of the North American Waterfowl Plan to achieve established objectives. Waterfowl production should increase by 60,000, with emphasis on species of special concern: mallard, pintail, canvasback, and redhead. Waterfowl and Canada goose populations would be enhanced through intensive marsh management to benefit upland nesting species,

overwater nesting species, and brood habitats. An increase of 66,500,000 waterfowl use days is expected as follows: tundra swans-450,000, geese-950,000, and ducks-65,100,000.

d. **Other Migratory Bird Management** (Appendix A-8)
Development of new impoundments and efficient water application would provide additional shallow water habitats for shore and wading birds. Improved residual emergent vegetation would provide additional habitat for nesting colonial birds. Habitat would be available to support an estimated additional 38,000,000 use days by shore, marsh, and water birds, gulls, terns, and allied species. Furthermore, production from this group would increase by 7,000 young per year. Increased residual cover would provide more prey species for raptors, and use days would increase by 1,500. Essential nesting and feeding habitats for passerine species would also be provided. At least 50 species are expected to nest on the Refuge area.

e. **Other Resident Wildlife** (Appendix A, p. 69)
Upland birds and small game populations would increase as cover, food, and breeding habitats improve.

f. **Fisheries** (Appendix A-13)
Fisheries resources would not be significantly impacted under this proposal. Efforts would be made to control the introduction of large fish into Refuge impoundments. However, ample deep water habitat would be available in the river and other locations for maintaining recreational fishery activities and sustaining native fish populations.

g. **Furbearers** (Appendix A-17)
Increases in marsh habitat and improved vegetative management are expected to provide an additional 20,000 use days for muskrat. Other species, such as beaver, mink, weasel, and skunk would also increase.

Under this alternative, the Service would undertake intensive management activities for wildlife enhancement. Short-term disruptions of habitats for wetland impoundment developments or alterations of vegetation to favor particular species would result in long-term improvements in desirable wildlife populations.

The ability to manage water within smaller marsh units would allow for the reduction and control of botulism outbreaks. It is anticipated that the number of birds lost to botulism would decrease by 80-85 percent.

Mammalian and avian predator populations would be limited by control practices, preventing their populations from growing to maximum levels. Species that prey on waterfowl nests, such as skunk, raccoon, red fox, ravens, and gulls, would be limited in favor of expanding waterfowl and other migratory bird species.

An additional 35,040 acres of fresh water marsh habitat would be placed under permanent protection as a component of the Refuge System. As such, easement areas would be protected from drainage and wetland destruction to ensure that future generations would be able to enjoy this unique resource.

Service management would benefit the habitat. For example, upland vegetation would be managed through Service objectives for grassland management (Appendix A-14), cropland management (Appendix A-15), grazing (Appendix A-16), fire management (Appendix A-17), and noxious weed control programs (Appendix A-11). Implementation of these management programs are designed to enhance overall productivity of grasses and forbs species. Some bare mudflats would be revegetated to a wetland-type community and additional edge effect created to provide excellent upland nesting habitat for wildlife. Grazing activity on the proposed expansion area would be curtailed, possibly resulting in a negative impact on the local cattle industry while benefitting the vegetative communities and their associated wildlife. Marsh vegetation would be enhanced to the benefit of over-water nesting of waterfowl and glossy ibis. Improved wetland plant communities would provide conditions ideal for the production of aquatic invertebrates, enhancing waterfowl brood habitats.

2. **Effects on Local and Regional Economics**
Through PILT, the local economy would benefit from increase payments for lands purchased in fee title. Taxes currently paid on the lands targeted for fee title purchase amount to approximately $3,000 per year. Service payments to the county would amount to $12,000-$18,000 per year. There would be no change in the taxing structure of those lands placed under lease agreements as the current owners would continue to pay taxes at the same rate they have in the past.

The 16,890 acres of purchased land and the 21,310 acres of land upon which easement agreements would be executed would be

acquired and appraised under Federal Land Acquisition policies. (Appendix C.)

Estimates for construction costs of water control systems, public use facilities, headquarters, maintenance facilities, roads, and trails would provide $8,000,000 to $10,000,000. An annual operating budget of approximately $800,000 for salaries and purchases is anticipated for the fully staffed, expanded Refuge, which would benefit the local/regional economy.

The Expansion Alternative would interject $8,000,000 to $9,000,000 into the local/regional economy for land acquisition and payments for easement agreements. There may be an extended time frame for acquisition of Refuge lands under this alternative that would allow acquisition and development funds to be infused gradually into the local economy.

This alternative may require the relocation of up to seven landowners whose homes and farming operations are within the fee acquisition area. If the landowners wish to relocate their operations, the Service is required by the Relocation Assistance Act to compensate the landowner for all reasonable costs associated with relocation and continuation of operations. The intent of the Act is to make the displaced landowner economically whole. Because of these requirements, no economic impacts associated with relocation of landowners are anticipated. Despite monetary compensation, there would be negative effects on individuals as a result of lifestyle disruption.

Access to the Refuge area and increased wildlife numbers would benefit the community by providing recreational opportunities for increased visitor usage. The benefits of wildlife observation, hunting, environmental education, and interpretation would be readily available.

Increased costs would be incurred by the Box Elder Mosquito Abatement district for mosquito control due to the use of biological controls rather than chemical controls.

No significant impacts are anticipated on local population. Despite an influx of Service staff, there may be a proportional departure of landowners who would sell and move away. No significant

alteration of the local school system or other population dependent functions would occur.

3. **Effects on Tourism and Recreation**
Service fee ownership of lands outside the floodplain would enhance public recreation benefits by providing services and programs for hunting, wildlife-oriented recreation, and environmental education programs. (Appendix A-17-24). A fully-staffed visitor center would be constructed to accommodate up to 200,000 visits per year. Auto tour routes and nature trails would be available in the area adjacent to the visitor center. Yearly visitation on the auto tour route would increase by 148,000 visits, while an estimated 20,000 persons would use the nature trails. An environmental education program would be set up for participation by local school districts. It is anticipated that 5,000 teachers and students would take part yearly in this activity. This public use center would enhance interpretation of other local features and be an economic benefit increasing tourist use of local service facilities. Direct visitor spending and the associated multiplier effects, would total about $1.8 million to the local economy in the first year of the new visitor center.

Consumptive wildlife uses would increase, since additional lands would be available for such use. It is anticipated that waterfowl hunter use days would double to 10,000 and that upland hunting visits would increase by 5,400 visits. Fishing use should increase by 700 visits per year. Use of air boats for waterfowl hunting within Refuge impoundments would be prohibited, but use of other types of shallow craft boats would be permitted. Launching facilities on the outer dike would be provided to allow hunters with air boats to reach State lands and Refuge areas south of the D-line Dike.

4. **Effects on Agricultural Practices**

The Expansion Alternative would have major impacts on land use by the private sector in the proposed expansion area. All private ownerships would be replaced by Service fee ownership of 17,000 acres of land and wetland easements placed on 21,000 acres. All land use in the fee acquisition portion of the Refuge would be subject to Federal regulation. Exclusive private use of the land for commercial or recreational activities would be replaced by public use regulations. Use of lands under easements would be subject to Federal rights, as spelled out in the easement agreement, which would mainly stipulate that the wetland complex not be destroyed. Any uses of the acquired fee land for roads, utilities, pipelines, or other rights-of-way would be regulated by public law, and any possible impacts to wildlife resources or habitats need to be mitigated before the activity could occur. Livestock grazing would likely be eliminated for a number of years. In the future, livestock grazing would be used as a management tool and restricted to certain times of the year in numbers that would achieve habitat management goals.

There would be a loss of 150 acres of prime agricultural land, plus another 250 acres of land currently used for pasture and croplands. Crops presently produced on this land are corn, small grains, alfalfa, irrigated and native pasture. This agricultural land would be placed into permanent upland cover to provide habitat for various upland games species. This would result in an annual loss to the agricultural community and local economy of $15,000. The purchase of this land is necessary to ensure that no block of private land is left in private hands where hunting clubs could be established within the heart of the Refuge. Up to seven families would be displaced under this Expansion Alternative. The Service is required by the Relocation Assistance Act to compensate any landowners who sell to the Service and who wish to relocate their operations for all reasonable costs associated with relocation and continuation of their operations. The intent of the Act is to ensure the displaced landowner remains economically whole. Because of these requirements, no economic impacts associated with relocation of landowners are expected. As can be expected in any situation requiring a relocation, and despite the monetary compensation, there would be negative effects on individuals as a result of disruption of lifestyles.

Use reservations resulting from negotiated acquisitions may restrict Service management activity in the short- term but would result in long-term wildlife benefits and public benefits.

Land use in the proposed expansion area would be irreversible and irretrievably shifted from the private sector to the Federally-controlled public sector. All activities involving land use would be subject to governmental regulations as they apply to the Service.

The shift from private to public land use would benefit the population-at-large to the detriment of a small group of the private sector. There would be a loss of some agricultural products, small grains, alfalfa, and pasture lands.

5. **Effects on Water Resources and Water Rights**

The Service would purchase water rights with the land in the fee purchase area. It is anticipated that 35 cubic feet per second of new water rights would be purchased, giving the Refuge 1035 cfs of water rights.

With new wetland areas under management, additional water would be needed for their optimal maintenance. Optimal water requirements would be an additional 86,477 acre feet under this alternative; however, benefits could be achieved on the additional land with less than optimal water requirements as multiple-use of the existing water rights are possible, Our Regional Office Water Resource Division would pursue any available water for purchase or lease from Bear River or other water sources within the area. Each water purchase would require extensive negotiations and the opportunity for public comment when water rights applications are applied for.

Insufficient water in the late summer period would remain a problem in dry years, but with improved management capabilities quality marsh units could be maintained. High spring flows would still be used in some years to flush the units. See Appendix D for calculation of water use.

This action would result in a beneficial impact on the water resource within the Refuge. Management objectives for water resources would not significantly impact water uses by the private

sector in the immediate vicinity, since the purchased water rights have been used for marsh management in the past.

More efficient use of the water resources would allow management flexibility of habitat and aid the reduction of botulism outbreaks.

During normal water years, it is anticipated that Service water management would have little effect on the State managed waterfowl areas to the south of the Refuge. Water in quantities similar to those under the other alternatives would be passed through the Refuge to these areas. In the first several years of leaching the new marsh, water quality passed on to the State areas would be of a poorer quality than presently furnished. However, once these areas are leached of salt, water quality would return tonormal. In dry years, little water would be available to pass on to the State managed areas. The State and the Refuge would coordinate water management needs and management plans designed to provide for optimum marsh habitat on lands managed by both agencies.

Conclusion

The Expansion Alternative would provide optimum benefits to wildlife populations under Service management. Bald eagles, white-faced ibis, snowy plovers, waterfowl, and shore and water birds are anticipated to increase use days at the Refuge. Nesting and production is expected to increase considerably. Predators of nesting waterfowl, both avian and mammalian, would be controlled to meet waterfowl objectives. Botulism losses could be reduced by 80-85 percent. Introduction of large fish into Refuge impoundments would be reduced, with no detrimental effect on the carp populations. Negative impacts to wildlife

TABLE 3. SUMMARY OF ALTERNATIVE CONSEQUENCES

MAJOR ISSUE	A. No Action	B. Restore	C. Enhance	D. Expand
WILDLIFE MANAGEMENT				
Endangered & Species of Concern	-	0	+	++
Waterfowl Production	-	-	+	++
Waterfowl Maintenance	-	-	+	+
Marsh, Shore, & Waterbird Maintenance	-	0	+	+
Residence Species Maintenance	-	+	+	++
Wildlife Diversity	-	0	0	+
Botulism Losses Prevented	-	-	++	++
Predatory Management Needed	-	+	-	--
WILDLANDS PROTECTED				
Habitats Preserved	-	0	+	++
LOCAL & REGIONAL ECONOMICS				
Population Structure	0	0	0	0
Benefits to Local Economy	-	0	+	++
County Tax Revenue	0	0	0	++
TOURISM & RECREATION				
Tourist Use	-	-	0	++
Environmental Education	-	-	-	+
Visitor Center	-	-	-	+
Auto Tour Route	-	0	0	+
Nature Trail	-	-	-	+
Waterfowl Hunting	-	0	+	+
Upland Game Hunting	-	0	+	+
Fishing	0	0	0	+
Air Boat Access	-	0	0	0
AGRICULTURAL PRACTICES				
Agricultural Land Acquired	0	0	0	+

Families Displaced	0	0	0	+
Agricultural Production	0	0	0	-
WATER RESOURCES & RIGHTS				
Water Rights	-	0	0	+
Effect Use of Water	-	+	+	+
Water Consumption	-	+	+	+
Key: "0" = No Change; "-" = Decrease; "+" = Increase				

resources would be transitory during development activities and would be mitigated by the long-term benefits to the wildlife populations.

Service management would benefit marshland habitats and provide protection from future destruction through easement agreements. Seasonally flooded mudflats would be converted to marsh/grassland habitat. Grazing would be curtailed in certain areas to improve desirable vegetative cover and used as a management tool in other portions of the Refuge.

Lands would be purchased by fee title or easement agreement on a willing seller basis only. These lands would be placed in permanent wildlife cover and retired from agriculture production. The Service would purchase water rights on those lands acquired in fee title. The Refuge would consume more water than it would under the Restoration Alternative, creating additional marshland habitat. Improved water management should reduce botulism outbreaks. Close cooperation between the Refuge and the State Wildlife Management Areas to the south would be needed to ensure the overall success of both agencies' programs. Initially, the quality of water flowing south may be reduced, but once leaching on new Refuge marshland habitat is completed, the quality would improve.

Up to seven families would have to relocate their operations, but this is expected to have little effect on the local population levels or on total agriculture production. This relocation would be paid for by the Service, but would result in a disruption of lifestyle for those families. However, the creation of additional wildlife habitat will benefit the public as a whole.

Although removed from the county tax roll, these lands would provide an increased revenue of approximately $12,000-$18,000 per year. The

Service would spend approximately $10,000,000 for construction of management and recreational facilities over several years time and approximately $800,000 annually for salaries and supplies. This alternative would have a positive effect on tourism and recreational aspects and add approximately $1.8 million to the local economy. Both nonconsumptive and consumptive recreation use would increase. Airboats would not be allowed on the impounded Refuge areas, but access would be provided for use of the lands south of D-line Dike. Through the visitor center, visitors would learn the history of the Refuge area, increase their understanding of the natural ecosystems and wildlife, and become more environmentally informed.

VI. CONSULTATION AND COORDINATION

Input on the proposed Refuge acquisition and rehabilitation was solicited from a variety of sources. A public scoping meeting attended by over 200 people was held at the Box Elder High School in December of 1989; personal contacts, telephone interviews, and correspondence were used to gather this information.

Relevant issues identified in the scoping process were:
- Wildlife/Wildlands Protection and Management
- Local and Regional Economics
- Tourism and Recreation
- Agricultural Practices
- Water Resources and Water Rights

The following alternatives were selected at the culmination of the scoping and in-house review for analysis in detail:

No Action - the area would remain as it is today. Bear River MBR would be allowed to naturally revert to an appearance that preceded development.

Restoration - most of the Refuge would be restored to the conditions existing prior to the damage caused by the flood.

Enhancement - existing Refuge lands would be more intensively managed for migratory birds.

Expansion - the Preferred Action by the Service. The Refuge boundary would be expanded through land acquisition to allow for intensive

wildlife and public use development and for protection of existing wetlands occurring outside the present boundary.

Following is a list representing interested parties contacted prior to preparation of this EA. These contacts were made through public meeting, formal scoping sessions, telephone, and correspondence:

Utah State University
Box Elder County Commissioners
Utah Department of Natural Resources - Division of Wildlife Resources
Utah Department of Natural Resources - Division of Water Rights
Box Elder Wildlife Federation
Bear River Club Company
Canada Goose Club, Inc.
Chesapeake Club
Bureau of Reclamation
University of Missouri
National Wildlife Health Lab at Madison, WI
Utah Farm Bureau
Mayor of Brigham City
Agricultural Stabilization and Conservation Service
U.S. Congressman James Hansen
U.S. Senators Jake Garn and Orin Hatch
Bear River Task Force Committee
Nature Conservancy
Utah Air Boaters Association
Bridgerland Audubon Society
Box Elder County Wildlife Federation
Bear River Friends of the Refuge
Local land owners, businessmen, and private citizens.

APPENDIX A

GOALS AND OBJECTIVES FOR

BEAR RIVER MIGRATORY BIRD REFUGE

BEAR RIVER MBR MISSION

Compatibility/Purpose Statement for existing Refuge: To provide the feeding, breeding, and resting habitat for migratory birds and other wildlife while maintaining the natural diversity of plants and animals native to the Bear River Basin.

Compatibility/Purpose Statement for the expanded Refuge: To provide for the protection, enhancement, and management of nationally significant wetlands for wildlife, public use, and other wetland values.

GOAL I: Threatened and Endangered Species
To protect and enhance Refuge habitat to maintain or increase use by Federally-listed endangered or threatened species.

Objectives

Bald Eagle
Enhance feeding and roosting opportunities
Output: 9,750 Use Days
Peregrine Falcon
Enhance feeding opportunities
Output: 250 Use Days
Snowy Plover
Increase nesting and feeding habitat
Output: 3,500 Use Days
100 Young Produced
White-faced Ibis
Enhance feeding and rookery opportunities
Output: 476,500 Use Days
3,400 Young Produced

GOAL II: Cultural Resources
To protect archaeological, historical, and other cultural resources.

Objectives

To protect and preserve any cultural sites on the Refuge. To incorporate historical features in the public interpretative programs.

GOAL III: Migratory Birds
To protect, enhance, develop, and maintain suitable production and migration habitat to benefit migratory birds in the greatest variety possible.

Objectives

Waterfowl
Provide nesting habitat for overwater and upland nesting species.
Output: 78,000 birds produced
Develop and maintain feeding habitat for divers and dabblers.
Output: 85,000,000 Use Days
Control disease and foster disease research.
Output: encourage use of refuge for disease research
Fish-eating Birds
Supply ample fish to maintain optimum pelican, egret, osprey, grebes and cormorant populations.
Output: 880,000 Use Days
Provide nesting sites for herons, egrets, osprey, grebes and cormorants.
Output: 2,500 Young Produced
Marsh and Waterbirds
Provide nesting and feeding habitat.
Output: 54,120,000 Use Days/9,500 Young Produced
Raptors
Enhance feeding habitat
Output: 5,000 Use Days
Passerines
Enhance upland or other habitat
Output: maintain 100 species

GOAL IV: Public Use
Provide opportunities for the public to observe, appreciate, and understand wildlife and people's role in the environment.

Objectives

Visitors Center
Provide an opportunity for the public to become informed about the Service and the natural world.
Output: 200,000 Visits
Consumptive Uses
Provide consumptive use programs for hunting, fishing and trapping that are compatible with other objectives.
Output: 18,500 Visits
Non-consumptive Uses
Provide auto tour routes, natural trails and environmental educational areas.
Output: 185,000 Visits

BEAR RIVER MIGRATORY BIRD REFUGE OUTPUTS UNDER VARIOUS ALTERNATIVES

Output	A. No Action	B. Restore	C. Enhance	D. Expand
Wetlands Enhanced (acres)	0	25,000	25,000	55,000
Endangered Species				
Bald Eagle				
Use Days	900	6,900	6,900	9,750
Production	0	0	0	0
Peregrine Falcon				
Use Days	100	100	100	250
Production	0	0	0	0
Species of Special Concern				
Snowy Plover				
Use Days	900	2,000	2,000	3,500
Production	30	50	50	100
White-faced Ibis				
Use Days	4,100	297,500	356,800	476,500
Production	170	450	1,150	3,400
Research Natural Area	1	1	1	1
Goose Production	100	1,000	2,000	5,000
Duck Production				
Divers, Redhead, Ruddy	100	1,000	4,000	14,000
Dabblers, Gadwall, Cinnamon/BW Teal	600	12,000	18,000	64,000
Waterbird Production				
Avocet, B-N Stilt, GB Heron, Snowy Egret, D-C Cormorant, Western Grebe, etc.	2,000	4,000	5,000	12,000
Furbearer Maintenance				
Muskrat	500	15,000	18,000	38,000
Waterfowl Maintenance (Use Days)				
Swan	0	1,000,000	1,350,000	1,800,000
Goose	35,000	660,000	900,000	1,850,000
Ducks	4,765,000	14,840,000	16,250,000	81,350,000
Coot Maintenance	35,000	5,100,000	7,200,000	15,000,000
Shore, Marsh, & Waterbirds Use Days	2,500,000	15,000,000	17,000,000	55,000,000
Raptors Use Days	3,000	3,500	3,500	5,000
Visits				
Environmental Ed.	0	0	0	5,000
Visitor Center	0	0	0	200,000
Wildlife Auto Tour	0	9,000	12,000	160,000
Nature Trail	0	0	0	20,000
Waterfowl Hunting	500	3,400	5,000	10,000
Upland Game Hunting	0	400	600	6,000
Fishing	1,800	1,800	1,800	2,500

Note: Consumptive Uses are Fee Title Lands Only!

OBJECTIVES STATEMENT FOR BEAR RIVER MBR

Introduction

The mission of the U.S. Fish and Wildlife Service (Service) is to provide, preserve, restore, and manage a national network of lands and waters sufficient in size, diversity, and location to meet society's needs for areas where the widest possible spectrum of benefits associated with wildlife and wildlands is enhanced and made available. Within this framework, the Service assists in the development of an environmental stewardship ethic for our society based on ecological principles, scientific knowledge of wildlife, and a sense of moral responsibility and guides the conservation, development, and management of the Nation's fish and wildlife resources and administers a national program, which provides opportunities to the American public to understand, appreciate, and wisely use these resources.

The goals of the National Wildlife Refuge System (Refuge System) are a guide to developing refuge management objectives for individual field stations. Objectives are based on the priority ranking of potential uses. The ranking defines the types of activities and programs that are most appropriate on refuges, and guides the general order in which those activities and programs may be provided through management. These rankings are: preservation (highest priority), resource management, information, and recreation. **Preservation** includes endangered species management, protection of threatened communities and cultural resources, and establishment of dedicated areas such as Natural Resource Areas. **Resource management** involves maintenance and production of migratory birds and other wildlife. **Information management** pertains to scientific study, environmental education, and interpretation. **Recreation** encompasses various

wildlife/wildlands oriented activities such as hunting, fishing, and wildlife observation.

According to this priority system, management objectives are developed in a nested fashion, beginning with higher priority uses and proceeding in stages to lower priority uses. The intent is not to limit the potential for lower priority activities and programs, but to ensure that they do not conflict with higher priority program objectives. In many cases, some flexibility among refuge priorities and corresponding management objectives is possible, depending on the Refuge in question.

Goals and objectives for managing areas within the Bear River Migratory Bird Refuge and the proposed Refuge expansion under any of the alternatives are displayed on the following pages in order of priority.

I. GOALS OF THE NATIONAL WILDLIFE REFUGE SYSTEM

Following are the goals of the National Wildlife Refuge System:

A. Preserve, restore, and enhance, in their natural ecosystems, all species of animals and plants that are endangered or threatened with becoming endangered.

B. Perpetuate migratory birds.

C. Preserve a natural diversity and abundance of fauna and flora on refuge lands.

D. Provide an understanding and appreciation of fish and wildlife ecology and man's role in his environment, and to provide refuge visitors with high quality, safe, wholesome, and enjoyable recreational experiences oriented toward wildlife to the extent these activities are compatible with the purpose for which the refuge was established.

II. SERVICE MANAGEMENT POLICY AND OBJECTIVES

A. Preservation Category

1. Endangered Species Management

a. Policy

The protection, enhancement, and recovery of endangered and threatened species will receive priority consideration in the establishment of Refuge objectives and the management of National Wildlife Refuges.

b. Service Objectives

i. Prevent any species of fish, wildlife, or plant from becoming extinct;

ii. Restore endangered or threatened fish, wildlife, or plant species to a viable, nonendangered status;

iii. Protect ecosystems upon which endangered or threatened species depend;

iv. Ensure that conflicts between endangered species and other wildlife management or public use programs are resolved in favor of endangered species.

c. Refuge Objectives

i. Protect the bald eagle as a migrant and enhance habitat for roosting use by planting trees or putting up artificial perching poles.

ii. Protect the peregrine falcon as a migrant and work with groups to encourage nesting near and use of the Refuge.

iii. Establish two white-faced ibis rookeries on the Refuge by managing habitat attractive to ibis nesting.

iv. Manage areas to attract snowy plover nesting through the creation of open, bare ground in close proximity to the marsh edge.

2. Cultural Resources Management

a. Policy

It is Service policy to identify, protect, and manage all significant cultural resources under the Service's jurisdiction, in a spirit of stewardship, for the benefit of future generations. Specifically, the Service will:

i. Manage, preserve, and protect sites, buildings, structures, and objects of cultural value for scientific study and public appreciation and use.

ii. Full consideration will be given to cultural resources during the appropriate stages of decision-making affecting these resources, such as construction, land use or resource planning, and land acquisition or disposal.

b. Service Objectives

i. Protect, maintain, and preserve significant cultural resources on Refuge lands for the benefit of present and future generations.

ii. Provide a good example of how to maintain and preserve the unique historical and cultural environment of the Nation, while meeting our ongoing natural resources and wildlife responsibilities.
iii. Continue cooperation with State Historic Preservation Officers, to locate, inventory, evaluate and nominate to the Keeper of the National Register all buildings, sites, districts, and objects on Refuge lands that appear to qualify for listing on the National Register of Historic Places.
iv. Ensure that cultural resources on Refuge lands are not inadvertently transferred, sold, demolished, or substantially altered.
v. Ensure that if property listed or eligible for listing in the National Register must be altered or demolished, the State Historic Preservation Officers and advisory Council on Historic Preservation are consulted, and timely steps are taken to make records of a quality equal to the standards established by the Secretary of the Interior.
vi. When developing viable plans, cooperate with purchasers or transferees of significant historical or archeological resources to use the property in a manner compatible with historical preservation objectives, without unnecessarily burdening public or private interests.
vii. Enhance educational interpretive benefits that may be derived from cultural resources on Refuge lands.

c. Refuge Objectives

i. Protect and preserve any sites having historical or cultural value (none known).
ii. Incorporate historical features of the area into public interpretative programs.

B. Resource Management Category

1. Waterfowl Management

a. Policy

Waterfowl management on refuges will be guided primarily by the provisions of the North American Waterfowl Management Plan. This National Waterfowl Management Plan provides overall direction of the management of this resource. Flyway Plans, Regional Resource Plans, and other management plans will provide specific details for waterfowl populations management on refuges. All management of waterfowl must be compatible with

the objectives for which the Refuge was established, meet general criteria for maintenance of natural diversity, provide protection for endangered and threatened species and be consistent with Refuge master and management plans.

b. Service Objectives

i. Protect, preserve, and enhance habitat so that waterfowl populations are maintained and distributed in accordance with the National Waterfowl Management Plan, Regional Resource Plans, and special population management plans.
ii. Perpetuate the resource for present and future public enjoyment and use.

c. Refuge Objectives

i. Work within the framework of the North American Waterfowl Plan to achieve the objectives established there.
ii. Produce 78,000 ducks with emphasis on species of special concern.
iii. Produce 5,000 geese yearly.
iv. Provide habitat to maintain 85,000,000 use days for all waterfowl species as follows:
- tundra swans 1,800,000 use days
- geese 1,850,000 use days
- ducks 81,350,000 use days

2. Other Migratory Bird Management

a. Policy

Refuges will be managed to maintain other migratory bird populations at a level consistent with their role in the ecosystem, taking into account the carrying capacity of the Refuge and adjacent areas.

b. Service Objectives

i. Maintain healthy populations of other migratory bird species, thus preventing them from becoming threatened.
ii. Preserve and manage refuge habitats needed for other migratory bird production, migration, and distribution goals.
iii. Minimize significant adverse influences of habitat loss, disease, predation, crippling, and illegal taking of other migratory birds, following the provisions of the Migratory Bird Treaty Act of 1916.

c. Refuge Objectives

Large populations of other migratory birds reside in or are transient in the Refuge area. Water, wading and shorebirds, raptors, and passerines all are present and will be considered in

management. Specifically, the following objectives have been established:

i. Provide for 55,000,000 use days by shore, marsh, and water birds, gulls, terns and allied species.
ii. Manage habitat for the maintenance and nesting success of 50 breeding species.

3. Other Resident Wildlife Management

a. Policy

Management practices for other resident wildlife on National Wildlife Refuges will emphasize protection of breeding stocks and production of wildlife to achieve a diversity of those species which naturally occur or historically occurred on the Refuge.

The special interest of various States in the management of resident animals is recognized and Refuge management actions for those species will be coordinated with State management, when possible.

It is Service policy to appraise the effects of predation on breeding waterfowl on Service lands. In circumstances where it is determined that waterfowl production objectives are being compromised because of predation on waterfowl or their eggs, the Service may implement predator management.

Service policy is to manipulate predator activities or densities only in those habitats where the ability to meet station waterfowl production objectives is in doubt, given current fecundity and mortality rates. This policy is to be implemented as a site-specific application when definite results are desired, not for the range-wide reduction of predator populations.

Habitat of quantity and quality sufficient to support the desired waterfowl production must be present on the area before predator management is used. Both wetlands and nesting habitat, which may include substantial uplands, must be in good condition. When appropriate, improvement of waterfowl nesting habitat is to be performed before the application of predator management, and shall continue during predator management activities.

On National Wildlife Refuges, implementation of operational programs to manage predator populations will only be conducted where waterfowl production objectives are a clear priority, and such action is compatible with the purposes for which the refuge was established.

b. Service Objectives

i. Ensure healthy, viable resident wildlife populations on National Wildlife Refuges.
ii. Manage Refuge lands to attain and perpetuate a natural diversity of wildlife species and their native habitats at optimum population levels.
iii. Identify all native species historically, but not presently, found on units of the refuge, restoring them where feasible and not contrary to existing Service policy.

c. Refuge Objectives

i. Manage Refuge lands so that habitat is provided for nesting species.
ii. Effectively manage avian and mammalian predators to reduce predation on waterfowl nests.

4. Disease Prevention and Control

a. Policy

It is Service policy to prevent and control wildlife diseases on refuges wherever practical or possible. While loss from disease is inevitable, management practices will be directed toward minimizing it. The Service will take a leadership role in developing better methods for wildlife disease control and in fostering cooperative control activities.

b. Service Objectives

i. Manage wildlife populations and habitats to minimize disease contraction and contagion.
ii. Provide for early detection and identification of disease mortality when it occurs.
iii. Minimize losses of wildlife from disease outbreaks.

c. Refuge Objectives

i. Marshland habitat will be managed to minimize the likelihood of disease outbreaks.
ii. The Refuge will be used by the Service's Madison Research Laboratory to continue investigation into wildlife diseases, with emphasis on botulism control and prevention.

iii. Work within a regional disease plan with the State and others when disease outbreaks do occur to minimize wildlife losses.

5. Pest Control Management

a. Policy

The policy of the Service is to engage in the control of wildlife and plants within the Refuge System to assure balanced wildlife and fish populations consistent with the optimum management of Refuge habitat.

Control programs must be designed to maintain environmental quality and to conserve and protect the nation's wildlife resources. They will be based upon a broad, systematic approach utilizing all available information on the ecology of the plant or animal pest, the factors that affect its capacity for damage, the nature and extent of damage that can be tolerated, and the effects of damage control options upon other organisms inhabiting the managed environment. An integrated pest management approach will be adopted in Refuge management activities.

No animal or plant considered a pest will be subject to control unless the following conditions are met:

i. The pest organism represents a threat to human health and well-being, or private property, the acceptable level of damage by the pest has been exceeded, or State or local governments have designated the pest as noxious.
ii. The pest organism is detrimental to primary Refuge objectives.
iii. The planned control program will not conflict with attainment of Refuge objectives or the purposes for which the Refuge is managed.

b. Service Objectives

i. Protect human health and well-being.
ii. Prevent substantial damage to significant resources.
iii. Protect newly introduced or re-established species.
iv. Control exotic species and allow normal populations of native species to exist.
v. Prevent damage to private property.
vi. Provide individuals with quality wildlife-oriented recreational experiences.

c. Refuge Objectives

i. Coordinate vertebrate pest control activities within the Department of Agriculture Animal/ Plant Health Inspection Service Animal Damage Control Division.
ii. Necessary mosquito control will be accomplished through the use of biological controls if mosquitos clearly present a health hazard to the public or domestic livestock.
iii. Remove and/or dispose of any trespassing domestic animal found at large on the Refuge, including livestock, dogs, and cats.
iv. Provide logistical and technical support for control of depredating waterfowl through modified crop production programs and use of scare devices.
v. Active treatment of pest weed species through use of properly registered herbicides, mechanical or biological control.

6. Trapping Management

a. Policy

The Service permits trapping of furbearing animals on refuge units where it may contribute to, or be compatible with the management objectives of the Refuge. The Service recognizes trapping as an effective tool of wildlife population management and a legitimate recreational and economic activity.

b. Service Objectives

i. Maintain furbearer populations at levels compatible with Refuge and surrounding habitat and with Refuge objectives.
ii. Contribute to the attainment of national migratory bird, mammal, non-migratory bird, and endangered species objectives or goals.
iii. Minimize furbearer damage to physical facilities, such as dikes and water control structures.
iv. Minimize competition with or interaction among wildlife populations and species that conflict with refuge objectives.

c. Refuge Objectives

i. Hold a lottery drawing for eight to ten muskrat trapping permits in order to prevent structural damage of physical facilities and wildlife habitat.
ii. Issue two to four permits to control predators on waterfowl. Targeted species include red fox, coyote, raccoon, and skunk. These species would be trapped during the regularly

designated furbearer seasons established by the Utah Department of Natural Resources.

iii. Use Refuge personnel to remove animals that may be causing predation to nesting species outside the designated furbearer seasons if needed to achieve Refuge objectives.

7. Fishery Resource Management

a. Policy

Fishery resources within the Refuge System will be managed primarily to maintain balanced, selfsustaining populations. Management emphasize will be on species native to the geographic area of the Refuge. Introductions of fish may be permitted when necessary to maintain the aquatic environment in support of Refuge fish and wildlife management objectives. Native species of fish will be the first choice for such introductions, otherwise, non-native species may be introduced.

b. Service Objectives

i. Maintain balanced, self-sustaining populations of fish species in Refuge waters.

ii. Provide opportunities for sport fishing pursuant to the Refuge Recreation Act. Fishing on Refuges will emphasis quality of the fishing experience. Priorities for harvest of surplus fish shall be subsistence fishing, sport fishing, and commercial fishing.

c. Refuge Objectives

i. Provide recreational fishing on reaches of Bear River and the upper end of the Reeders Overflow within the framework of state regulation.

ii. Control rough fish, primarily carp, in Refuge impoundments for the protection of aquatic vegetation.

8. Marsh and Water Management

a. Policy

It is Service policy to manage marsh and water to meet the needs of the entire marsh community. In pursuit of this policy, all marsh and water management efforts will be consistent with sound fish and wildlife protection, maintenance, enhancement and utilization principles and practices. All marsh and water management actions must be in strict compliance with the basic intent of all applicable environmental laws and regulations.

b. Service Objectives

i. Provide habitat for waterfowl, other migratory birds, and endangered or threatened species of plants and animals.

ii. Maintain wildlife diversity in the marsh.

iii. Provide, enhance, and maintain habitat for indigenous species of wildlife and plants.

iv. Manage water and marsh resources to reduce botulism outbreaks and minimize their effects.

v. Provide opportunities for compatible wildlife-oriented recreation and interpretation.

c. Refuge Objectives

i. As lands are acquired, secure water rights, including any necessary additional water rights available on the open market.

ii. Conduct water management activities within the framework of existing State of Utah water law.

iii. Major water diversion canals will carry excess spring flows through the Refuge into the Great Salt Lake.

iv. In order to enhance waterfowl nesting and brood habitat, develop additional water management units using a low head diking system with water outlet control structures.

v. Create a complex of islands within the wetland complex for nesting waterfowl.

vi. Improve upland nesting habitat through management to provide safe nesting habitat for dabbling duck species.

vii. Control water levels within the wetland complex for optimum habitat conditions and effective use of the water resource.

9. Grassland Management

a. Policy

Grasslands are an important part of the Refuge habitat base requiring professional management to support Service, Refuge System, and individual refuge objectives. As with other ecosystems, grasslands are a dynamic resource warranting continuous stewardship to promote wildlife productivity for public benefit.

It is Service policy to manage grassland areas in ways that:

i. foster recovery of deteriorated natural grasslands.

ii. maintain those natural grasslands that have not been seriously degraded.

iii. Restore native grasslands, where practical.

iv. Use introduced or domestic grasses only where natural communities cannot be restored to attain refuge objectives.

b. Service Objectives

i. Produce or modify specific cover types to meet the needs of wildlife species for which objectives have been established (e.g., waterfowl production).
ii. Maintain, rehabilitate, or reestablish natural grassland communities.
iii. Produce foods for those wildlife species for which objectives have been established (e.g., pronghorn maintenance).
iv. Protect water quality and soils from erosion.

c. Refuge Objectives

i. Provide dense nesting cover on marginal upland areas converted from existing farmlands.
ii. Utilize management practices, such as grazing or burning, to establish or maintain native grass species or to rehabilitate grasslands that are no longer productive as nesting cover or habitat for managed species.

10. Cropland Management

a. Policy

Service policy calls for the most natural means available to meet wildlife objectives. In situations where objectives cannot be met in this way, more intensive and artificial methods of cropland management may be employed. Acreage devoted to croplands will be the minimum required to meet approved objectives. According to Service policy, long term productivity of the soil must not be jeopardized to meet wildlife objectives.

b. Service Objectives

The objectives of cropland management vary according to locale. Selected objectives relevant to refuges in western portions of the country include:

i. Produce supplemental grain and browse foods to maintain wildlife populations at approved objective levels.
ii. Provide nesting and winter habitat.
iii. Prepare land for seeding semi-permanent or permanent cover.
iv. Reduce depredations on surrounding privately-owned lands.
v. Manipulate flock behavior to provide recreational opportunities (other than hunting) of optimum quantity and quality.

vi. Research and demonstrate farming practices beneficial to both wildlife and farmers.
vii. Assure cooperating farmers of economic incentives (e.g., crop production in excess of wildlife needs is retained by cooperating farmers).

c. Refuge Objectives
Place agricultural croplands in permanent upland cover types.

11. Grazing and Haying Management

a. Policy
Grazing and haying are habitat management tools that can enhance resource management objectives on refuge units. All grazing and haying programs should serve as models of sound resource management. Grazing and haying activities may be permitted:
i. on a primary basis when enhancing, supporting, and contributing to established wildlife management objectives.
ii. on a secondary basis when utilizing a renewable natural resource and when there is no conflict with established wildlife management objectives.

b. Service Objectives
The primary objective of grazing or haying on Refuge lands is to manage vegetation for the benefit of wildlife at minimum cost to the Government. The use of an available resource and the generation of economic benefits may be considered objectives only when demonstrably compatible with the purposes for which the refuge was established.

c. Refuge Objectives
Use of lands for grazing has been a long standing practice on portions of the proposed acquisition lands. Acquisition of this land will reduce the number of cattle commonly pastured there. The Refuge will:
i. reduce cattle on the marsh areas for several years (perhaps five). This reduction will protect residual vegetation needed by waterfowl for nesting cover.
ii. allow controlled grazing at a rate that will allow marsh areas to be productive for waterfowl production and other objectives as determined by competent range analysis and an approved grazing plan.

12. Fire Management

a. Policy
It is the policy of the Service to employ fire whenever it is the most appropriate management tool for Refuge resources and to protect against fire whenever it threatens Refuge resources, private property, or human health and safety. Every wildfire on refuge lands will be aggressively suppressed unless its nature and character are such that it qualifies under an approved fire management plan either 1) as a prescribed fire, or 2) for modified suppression action. Prescribed fires, including ignitions by natural causes, may be used as a tool under approved management plans.

The safety of personnel involved in wildfire suppression and prescribed burning on Refuge lands is of paramount concern. With the possible exception of rescuing an individual whose life is threatened, no Service employee, contractor, or cooperator will be exposed to life-threatening conditions or situations.

The Service encourages the use of contracts and cooperative agreements to provide the needed suppression capability on a refuge rather than building up its own capability. Care must be exercised to ensure the cost efficiency of such agreements.

b. Service Objectives
The objective of fire management in the Refuge System is to protect and enhance habitat for the production and diversity of fish and wildlife and the promotion of natural ecosystems.

c. Refuge Objectives
As a participating member of the Boise Interagency Fire Center, the Service will take an active role in suppressing and preventing Refuge fires. The Service will implement its fire management activity through mutual aid agreements with local fire districts. Fire will be used as a management tool when it has been proven to be the most cost effective or the only way to achieve Refuge objectives.

C. Public Use Category

1. Studies and Publications

a. Policy
It is the policy of the Service to advance public awareness, understanding, and appreciation of the functions of ecosystems

and the benefits of their management for fish, wildlife, and people.

b. Service Objectives
Provide study sites, facilities, and active support for educational programs focusing on fish and wildlife resources and environmental problems.

c. Refuge Objectives
Encourage educational institutions to use the Refuge as a study site for a wide variety of investigations involving wildlife, wildland habitats, and the interaction of the visiting public upon wildlife and their habitats.

2. Public Use Management - General

a. Policy
Wildlife/wildland-oriented public use will be encouraged on Service lands when funds are available to support such use and where such activities are compatible with refuge purposes. Public use programs will provide a wide array of opportunities for the visitor to enjoy while gaining an understanding and appreciation for fish, wildlife, wildlands ecology, and wildlife management. Public use will be in strict conformance with applicable Federal and State statutes and compatible with the Refuge's primary purpose. New on-site activities should be wildlife/wildlands-related whenever possible. Both consumptive and non-consumptive uses are encouraged.
Nonwildlife/wildland recreational activities on refuges will be de-emphasized and phased out, except when mandated by statute. Any discontinued activity may be replaced with a more appropriate wildlife/wildlands-oriented recreational activity. Such a replacement must be clearly justified in plans designed to phase out any recreational activities.

b. Service Objectives

i. Provide the public with wildlife/wildlands-related opportunities when compatible with the primary purpose of individual refuges.

ii. Provide visitors the opportunity to enjoy appropriate activities on Refuge lands and learn about the relationships of plant and animal populations within the ecosystem.

iii. Increase public understanding of natural resource management programs and ecological concepts to enable the public to:

(a) better understand problems facing our wildlife/wildlands resources;
(b) realize what effect the public has on wildlife resources;
(c) learn about the Refuge System's role in conservation;
(d) better understand the biological facts upon which Service management programs are based;
(e) foster an appreciation for the importance of wildlife to people;
(f) participate in maintaining and enhancing a healthy environment.

c. Refuge Objectives
Public use management objectives will concur with established Service objectives and national policy.

3. Public Relations Management

a. Policy
Refuge personnel will develop effective communications between the Service and the public.

b. Service Objectives

i. Provide information about Refuge objectives, programs, policies, and activities.

ii. Foster a spirit of cooperation and goodwill between Refuge staff and residents in the refuge vicinity.

iii. Foster communications with State and other Federal agencies, sportsmen, and special interest groups, especially those constituents expressing an interest in refuge programs.

c. Refuge Objectives

i. Provide information on newsworthy events through news releases, interviews, and media contacts.

ii. Involve the Refuge and its staff in active participation in local community activities or programs.

4. Outdoor Classroom and Educational Assistance Management

a. Policy
It is Service policy to advance public awareness, understanding, and appreciation of the functions of ecosystems and the benefits of their management to fish, wildlife, and people. This will be pursued through:

i. provision of lands and facilities for study purposes;
ii. provision of environmental education (EE) written materials;
iii. assistance to educators;
iv. participation in EE councils; and

v. cooperation with groups and organizations in the development of offsite EE programs.

b. Service Objectives

i. Provide study sites, facilities, and active support for educational programs that focus on fish and wildlife resources and environmental problems.

ii. Promote awareness and understanding of resource issues, particularly those related to fish and wildlife resources and to wildlife management.

iii. Support management objectives by providing information on the ecological basis and need for scientific wildlife management and the purposes of the Refuge System.

c. Refuge Objectives

i. Provide facilities for a study site and actively support educational use of this site.

ii. Ensure that educators, particularly natural science teachers in the local school districts, are aware of the available facilities for outdoor education.

iii. Function as facilitators in teacher workshops and seminars, such as "Project Wild" programs.

5. Interpretative Programs Management

a. Policy

Management of the Refuge System, within the guidelines of the Refuge Recreation Act, will provide the public with quality interpretation of fish and wildlife and their habitats, cultural resources, and scientific resource management practices.

b. Service Objectives

i. Increase public awareness, understanding, appreciation, and support of the natural environment (particularly fish and wildlife), wildlife management programs, and the Refuge System.

ii. Provide the public with safe, enjoyable interpretive experiences, (Self-guided opportunities and techniques take priority over Refuge-guided programs).

iii. Inspire visitors to further their comprehension of wildlife, habitat, and resource issues.

c. Refuge Objectives

i. Establish a strategically located visitor center to expose approximately 200,000 visitors per year to what the Refuge has to offer.

ii. Provide on and off-site presentations, programs, and services.

iii. Provide self-guided services using audio-visual aids, self guided trails, auto tour routes, signs and interpretative publications.

6. Hunting Programs Management

a. Policy

The Secretary of the Interior is authorized by the National Wildlife Refuge System Administration Act of 1966, as amended, and the Refuge Recreation Act of 1962 to permit hunting on any refuge within the Refuge System upon a determination that hunting is compatible with the major purposes for which such areas were established. In addition to a compatibility determination, the Refuge Recreation Act also requires the Secretary to determine that funds are available for the development, operation and maintenance of the hunting program.

The Service has long recognized the significant positive benefits that can be attributed to a well-managed hunt. Hunting is an acceptable traditional form of wildlife-oriented recreation that can double as a management tool for the effective manipulation of wildlife population levels.

b. Service Objectives

i. Provide the public with a quality wildlife-oriented experience and the opportunity to utilize a renewable natural resource; and

ii. Maintain wildlife populations at levels compatible with the Refuge habitat.

c. Refuge Objectives

i. Open up to 40 percent of the area, as prescribed in the agreement with the State of Utah, to the hunting of migratory waterfowl within the framework prescribed by the Utah Department of Natural Resources.

ii. Allow hunting of upland game birds and resident mammals on a portion of the Refuge.

iii. Ensure clear designation of hunting areas versus general public use areas so that neither use encroaches upon the other.

iv. Allow airboat access to State-owned and Refuge lands to the south of the Refuge boundary for hunting of migratory waterfowl. Parking areas and launch facilities will be provided.

7. Sport Fishing Program Management

a. Policy

The Secretary of the Interior is authorized by the National Wildlife Refuge System Administration Act of 1966, as amended, and the Refuge Recreation Act of 1962 to permit sport fishing on any National Wildlife Refuge upon determination of its compatibility with its major purposes. In addition to this determination, the Refuge Recreation Act also requires the Secretary to determine the availability of funds for the development, operation, and maintenance of the program.

Sport fishing is an acceptable, traditional form of wildlife-oriented recreation that can be, and is sometimes used as a management tool to manipulate fish population levels.

b. Service Objectives

i. Provide the general public with high quality, wildlife-oriented recreation and an opportunity to utilize a renewable resource.

ii. Maintain fish populations at optimum levels.

c. Refuge Objectives

i. Allow sport fishing within the framework of Utah Dept. of Natural Resources regulations.

ii. Limit access to the main stream of Bear River and 1.25 miles of the northern end of the Reeder Overflow Canal.

8. Off-Road Vehicle Use Management

a. Policy

All lands within the Refuge System are closed to public off-road use of vehicles, unless specifically designated otherwise.

b. Service Objectives

i. Ensure control of off-road vehicle use on Refuge lands, guarding against a significant adverse environmental impact or irreversible damage to existing resources.

ii. Minimize conflicts with other uses of Refuge lands.

iii. Provide for public safety.

c. Refuge Objectives

i. Allow off-road vehicles only for activities supporting Refuge operations, such as grazing programs, animal control, trapping programs, or contract weed-spraying operations.

ii. Recreational off-road vehicle use will not be permitted in any season.

9. Other Recreation Management

a. Policy

Public use programs on National Wildlife Refuges will be developed primarily to foster activities directly associated with the utilization, observation, interpretation, or understanding of fish and wildlife populations, their habitats, and conservation values.

Non-wildlife/wildlands-oriented recreation will be de-emphasized on most refuges. However, it is recognized that there are some unique situations where non-wildlife oriented recreation activities have co-existed in harmony with wildlife needs. Refuge planning will contain specific, detailed guidance on the management of such non-wildlife-oriented recreational activities.

b. Service Objectives

i. Provide high quality outdoor wildlife and wildlands recreational opportunities compatible with the purposes for which the Refuge was established.

ii. Provide opportunities for the public to develop an appreciation for wildlife and wildlands through direct association.

iii. Continue non-wildlife/wildlands-oriented recreation on refuges where legal mandates require such action.

c. Refuge Objectives

Allow canoeing or boating on the main stream of Bear River to the old headquarters site. Canoeing trails may be developed within specific units as determined by future meeds. Camping is to be de-emphasized according to National Policy. Camping will be considered upon development of a public use plan.

10. Visitor Protection

a. Policy

The Service has a responsibility of ensuring the safety of visitors to its refuges. Therefore, it is Service policy that Refuge personnel take all reasonable measures to protect the public from hazards inherent in the refuge environment.

b. Service Objectives

i. Eliminate hazards to the public whenever possible.

ii. Control access into hazardous areas where feasible.

ii. Inform refuge visitors of potential hazards existing on the Refuge.

c. Refuge Objectives

i. Design and maintain facilities with public safety in mind.
ii. Warn visitors of hazardous areas by means of signs and other printed information.
iii. Control public access to hazardous areas.

D. Non-Wildlife/Wildlands Use Category

Most units of the Refuge System maintain other activities having little relationship to the primary purposes for which they were established. Most of these relate to pre-existing activities on the lands at the time they were purchased, such as transportation corridors, utilities right-of-way, or reserved rights. These items must be addressed in terms of the day-to-day management of the Refuge area. Management of these non-conforming uses is accomplished usually through administrative management actions. The following policy and objective statements deal with non-conforming activities in the administration of the Bear River Migratory Bird Refuge.

1. Right-of-Way Management

a. Policy

It is Service policy to discourage right-of-way requests. If a right-of-way cannot be certified as compatible with the purposes for which the refuge was established, the right-of-way cannot be granted without Congressional authorization. Regulations on the granting of rights-of-way on and across refuge lands are promulgated in Title 50, Code of Federal Regulations, Parts 29.21 and 29.22.

b. Service Objectives

i. The Regional Office (Division of Realty) will review right-of-way applications for adequacy and resolve any legal questions.
ii. The Regional Office will also prepare the appraisal of fair market value of the right-of-way and prepare the permit document and appropriate charges to the applicant.
iii. The Regional Office will ensure that all environmental compliances are met and compatibility exists before a permit is issued.
iv. Special considerations must be met when applying to the Department of Energy for certain power transmission lines and certain oil and gas pipelines.
v. If an oil and/or gas pipeline crosses lands administered by more than one Federal agency, the right-of-way permit must

be issued by the Bureau of Land Management. Compatibility determinations must be made for each separately administered land unit.

c. Refuge Objectives

i. Refuge management will ensure against occupancy of Refuge lands unless a right-of-way has been granted. The application will be considered, and a package of information addressing all environmental compliances will be developed.
ii. If a right-of-way is granted, the Refuge manager is responsible for monitoring construction and operation of the facility to ensure compliance with the terms and conditions of the permit for the protection of the Refuge and the public.

d. Special Note

Right-of-way should not be confused with rights reserved or outstanding at the time of acquisition. In these cases, a special use permit with stipulations protecting Refuge values authorizes entry. There is no charge for special use permits; however, surface damages beyond the ordinary or expected can be assessed to the user.

APPENDIX B

REFUGE ENABLING LEGISLATION

BEAR RIVER MIGRATORY BIRD REFUGE

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AN ACT TO ESTABLISH THE BEAR RIVER MIGRATORY BIRD REFUGE

PUBLIC LAW NO. 304 - 70TH CONGRESS

Be it enacted by the Senate and House of Representatives of the United States of American in Congress assembled, That the Secretary of Agriculture is hereby authorized to construct, at Bear River Bay and vicinity, Utah, such dikes, ditches, spillways, buildings, and improvements as may be necessary, in his judgement, for the establishment of a suitable refuge and feeding and breeding grounds for migratory wild fowl; also to acquire, by purchase, gift, or lease, water rights and privately-owned lands, including the improvements thereon, deemed necessary by him for the purpose, or, in lieu of purchase, to compensate any owner for any damage sustained by reason of the submergence of his lands.

Sec. 2. That such lands, when acquired in accordance with the provisions of this Act, together with such lands of the United States as may be designated for the purpose by proclamations of Executive orders of the President, shall constitute the Bear River Migratory Bird Refuge and shall be maintained as a refuge and breeding place for migratory birds included in the terms of the convention between the United States and Great Britain for the protection of migratory birds, concluded August 16, 1916.

Sec. 3. That no such area shall be acquired by the Secretary of Agriculture unless or until the Legislature of the State of Utah has consented to the acquisition of lands by the United States for use as a refuge for migratory wild fowl, and shall have provided for the use as a refuge for migratory wild fowl by the United States of any lands owned or controlled by the State in Bear River Bay, Utah, and vicinity, which the Secretary of Agriculture may deem necessary for such purpose, and which the Secretary of Agriculture is hereby authorized to accept on behalf of the United States; and except in the case of a lease, no payments shall be made by the United States for any such area until title thereto is satisfactory to the Attorney General.

Sec. 4. That the existence of a right-of-way easement or other reservation or exception in respect of such area shall not be a bar to its acquisition (1) if the Secretary of Agriculture determines that any such reservation or exception will in no manner interfere with the use of the area for the purposes of this Act, or (2) if in the deed or other conveyance it is stipulated that any reservation or exception in respect of such area, in favor of the person from the United States receives title, shall be subject to regulations prescribed under authority of this Act.

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Sec. 5. That no person shall take, injure, or disturb any bird, or nest or egg thereof, or injure or destroy any notice, signboard, fence, dike, ditch, dam, spillway, improvement, or other property of the United States on any area acquired or received under this Act, or remove therefrom or cut, burn, injure, or destroy any grass or other natural growth thereon, or enter, use, or occupy the refuge for any purpose, except in accordance with regulations prescribed by the Secretary of Agriculture: Provided, That at no time shall less than 60 per centum of the total
acreage of the said refuge be maintained as an inviolate sanctuary for such migratory birds.

Sec. 6.

(a) Any employee of the Department of Agriculture authorized by the Secretary of Agriculture to enforce the provisions of this Act 1) shall have power, without warrant to arrest any person committing in the presence of such employee a violation of this Act or of any regulation made pursuant thereto, and to take such person immediately for examination or trail before an officer or court of competent jurisdiction, and 2) shall have power to execute any warrant or other process issued by an officer of court of competent jurisdiction to enforce the provisions of this Act or regulations made pursuant thereto. Any judge or a court established under the laws of the United States, or any United States commissioner may, within his respective jurisdiction, upon proper oath or affirmation showing probably cause, issue warrants in all such cases.

(b) All birds or animals, or parts thereof, captured, injured, or killed, and all grass and other natural growths, and nests and eggs of birds removed contrary to the provisions of this Act or any regulation made pursuant thereto, shall, when found by such employee or by any marshal or deputy marshal, be summarily seized by him, and upon conviction of the offender or upon judgment of a court of the United States that the same were captured, killed, taken, or removed contrary to the provisions of this Act or of any regulations made pursuant thereto, shall be forfeited to the United States and disposed of as directed by the court having jurisdiction.

Sec. 7. That the Secretary of Agriculture is authorized to make such expenditures for construction, equipment, maintenance, repairs, and improvements, including necessary investigations, and expenditures for personal services and office expenses at the seat of government and elsewhere, and to employ such means as may be necessary to execute the functions imposed upon him by this Act and as may be provided for by Congress from time to time.

Sec. 8. That there is hereby authorized to be appropriated, out of any money in the Treasury not otherwise appropriated, the sum of $350,000; or so much thereof as may be necessary to effectuate the provisions of this Act: Provided, That not to exceed $50,000 may be expended for the purchase of land, including improvements thereon.

Sec. 9. That any person who shall violate or fail to comply with any provision of, or any regulation made pursuant to, this Act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not more than $500 or be imprisoned not more than six months, or both.

Sec. 10. That, as used in this Act, the term "person" includes an individual, partnership, association, or corporation.

Approved, April 23, 1928

Joint Resolution to Amend Section 1 of the Act entitled "An Act to establish the Bear River Migratory Bird Refuge," approved April 23, 1928.

Resolved by the Senate and House of Representatives of the United State of America in Congress assembled, That the act entitled "An Act to Establish the Bear River Migratory Bird Refuge," approved April 23, 1928 (45 Statutes at Large, page 448), be, and the same hereby is, amended by adding at the end of Section one, the following: "Provided, that, when the public interests will be benefitted thereby, the Secretary of the Interior by, and hereby is, authorized in his discretion to accept on behalf of the United States title to any lands within Townships 8, 9, and 10 North, Ranges 2, 3, 4, and 5 West, Salt Lake Meridian, which, in the opinion of the Secretary of Agriculture, are chiefly valuable for the purposes contemplated under this Act, and in exchange therefore may patent not to exceed an equal value of public lands in the State of Utah, non-mineral in character; Provided, further that before any such exchange is effected, notice of the contemplated exchange, reciting the lands involved, shall be published once each week for four successive weeks in some newspaper of general circulation in the county or counties in which may be situated the lands to be accepted, and in some like newspaper published in any county in which may be situated any lands to be given in such exchange."

S. B. No 77 By Mr. Young

1929

AN ACT CONSENTING TO THE ACQUISITION BY THE UNITED STATES OF PRIVATE LANDS AND THE USE OF STATE LANDS FOR THE ESTABLISHMENT AND MAINTENANCE OF THE BEAR RIVER MIGRATORY BIRD REFUGE

Be it enacted by the Legislature of the State of Utah:

Section 1. The consent of the State of Utah is hereby given to the acquisition by the United States by purchase, gift, or lease of such areas of land or water or of land and water in Utah as the United States may deem necessary for the establishment and maintenance of the Bear River Migratory Bird Refuge in accordance with and for the purposes of the Act of Congress approved April 23, 1928, entitled "An Act to Establish the Bear River Migratory Bird Refuge," 45 U.S. Statutes at Large, Page 448; reserving, however, to the State of Utah full and complete jurisdiction and authority over all such areas not incompatible with the use and control thereof by the United States for the purposes and under the terms of said Act of Congress.

Section 2. The use by the United States as a Refuge for migratory wild fowl under the terms of the aforesaid Act of Congress, so long as the same shall be devoted thereto and no longer, is hereby granted of any lands owned or controlled by the State of Utah in Bear River Bay, in Box Elder County, Utah, situated in the following described area: Townships 8, 9, and 10 North, Ranges 2, 3, 4, and 5 West, Salt Lake Meridian, which the Secretary of Agriculture may deem necessary for such purpose, subject, however, (a) to the right of the State to dispose of any and all minerals in or upon and lands or water under such conditions as will interfere as little as possible with said Refuge, and (b) to the development and presentation to the Governor of the State by the United States, of a definite plan of control and administration of said Refuge and of plans of constructing dikes, ditches, spillways, buildings, and other improvements incident thereto. Provided, that the State of Utah reserves any and all State lands in Township 10 North, Range 4 West, Salt Lake Meridian, which are now in use or may in the future be used as a State public shooting grounds.

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BEAR RIVER MIGRATORY BIRD REFUGE - UTAH

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

Whereas it is provided by section 2 of the act of Congress, approved April 23, 1928 (45 Stat. 448), entitled "AN ACT To establish the Bear River Migratory Bird Refuge," that lands acquired by the Secretary of Agriculture in accordance with said act "together with such lands of the United States as may be designated for the purpose by proclamations or Executive orders of the President, shall constitute the Bear River Migratory Bird Refuge";

NOW, THEREFORE, I, HERBERT HOOVER, President of the United States, by virtue of the power in me vest by the aforesaid act of Congress, and otherwise, do hereby make known and proclaim that I do hereby reserve from settlement and entry and/or any other form of disposition under the public land laws, and do hereby set apart and designate for the purpose of the Bear River Migratory Bird Refuge, subject to existing valid rights in any parts or parcels thereof under the public land laws, the lands of the United States in Box Elder County, Utah within the boundaries particularly described as follows, to wit:

Salt Lake Meridian

Beginning at the standard corner of Tps. 8 and 9 N., Rs. 3 and 4 W.;
Thence from said initial point,
Southerly, between secs. 1 and 6 and secs. 7 and 12, to the north sixteenth-section corner of secs. 7 and 12, Tsp. 8 N., Rs. 3 and 4 W.;
Thence easterly, in T. 8 N., R 3 W., on subdivisional lines of secs. 7, 8, 9, 10, 11, and 12, to the north sixteenth-section corner on the east boundary of sec. 12;
Thence N 85° 29' E., in T. 8 N., R. 2 W., 245.91 chs. to the meander corner of fractional secs. 3 and 10;
Thence S. 31° 30' W., on the riparian dividing line as shown on General Land Office supplemental plat of secs. 9, 10, and 16, T. 8 N., R. 2 W., approved April 18, 1928, to auxiliary meander corner No. 3, sec. 16, on the northeast shore of Great Salt Lake;
Thence S 31° 30' W., within Great Salt Lake, 176.00 chs. to a 12 by 12 by 22-in. concrete block;
Thence west, within Great Salt Lake, 334.87 chs. to an iron pipe at the center of sec. 28, T. 8 N., R. 3 W.;

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Thence westerly, on the center line of secs. 28, 29, and 30, to the quarter-section corner of secs. 25 and 30, Tps. 8 N., Rs. 3 and 4 W.;

Thence continue westerly, on the center line of secs. 25 and 26, to the center of sec. 26, T. 8 N., R. 4 W.;

Thence west, 1 mile, to a point in Great Salt Lake;

Thence N. 51° 21' W., across Bear River Bay, 839.37 chs. to the northeast corner of lot 3, sec. 20, T. 9 N., R. 5 W., on the northwest shore of Great Salt Lake;

Thence westerly, through the center of sec. 20, to the quarter-section corner of secs. 19 and 20;

Thence northerly, between secs. 19 and 20, 17 and 18, and 7 and 8, to the corner of secs. 5, 6, 7, and 8;

Thence easterly, between secs. 5 and 8, to the corner of secs. 4, 5, 8, and 9;

Thence northerly, between secs. 4 and 5, to the closing corner of secs. 4 and 5, on the township line between Tps. 9 and 10 N., R. 5 W.;

Thence easterly, along the south boundary of secs. 32, 33, 34, and 35, T. 10 N., R. 5 W., to the corner of secs. 35 and 36;

Thence northerly, between secs. 35 and 36, to the corner of secs. 25, 26, 35, and 36;

Thence easterly, between secs. 25 and 36, to the corner of secs. 25, 30, 31, and 36, Tps. 10 N., Rs. 4 and 5 W.;

Thence southerly, between secs. 31 and 36, to the corner of Tps. 9 and 10 N., Rs. 4 and 5 W.;

Thence easterly, along the north boundary of secs. 6, 5, 4, and 3, T. 9 N., R. 4 W., to the northeast corner of sec. 3;

Thence Southerly, between secs. 2 and 3 and secs. 10 and 11, in T. 9 N., R. 4 W., to the meander corner of fractional secs. 10 and 11;

Thence N. 68° 45' W., along the meander line of sec. 10, crossing the Bear River Club co. dike, 3.68 chs. to an iron pipe 150 ft. distant at right angles from center line to said dike as now constructed;

Thence S. 0° 50' E., parallel to, and 150 ft. distant at right angles from, the center line of said dike, in part through sec. 23, 135.25 chs. to an iron pipe in the southwest quarter of sec. 23;

Thence S. 24° 16' E., parallel to, and 150 ft. distant at right angles from said dike, in part through sec. 23 and sec. 26, 52.24 chs. to a concrete post in the northwest quarter of sec. 26;

Thence S 48° 11' E., parallel to, and 150 ft. distant at right angles from said dike, through sec. 26, 75.76 chs. to an iron pipe on the line between secs. 25 and 26;

Thence southerly, between secs. 25 and 26, 1.54 chs. to an iron pipe, the corner of secs. 25, 26, 35, and 36;

Thence easterly, between secs. 25 and 36, to the east corner of lot 4 in sec. 36, on the right bank of Bear River;

Thence southwesterly, with the southeast boundary of lot 4, sec. 36, along the right bank of Bear River to the south corner of said lot 4 on the line between secs. 35 and 36;

Thence northerly, between secs. 35 and 36, to an iron pipe, the corner of secs. 25, 26, 35, and 36;

Thence westerly, between secs. 26 and 35, along the south boundary of lot 6, sec. 26, to the right bank of Bear River;

Thence northwesterly, with the south boundary of lot 6, in sec. 26, along the right bank of Bear River, to the corner between lots 5 and 6;

Thence southerly, crossing Bear River and on subdivisional lines of sec. 26 and sec. 35, to the east sixteenth-section corner, secs. 2 and 35, on the south boundary of T. 9 N., R. 4 W.;

Thence easterly, along the south boundary of sec. 35 and sec. 36, to the standard corner of Tps. 8 and 9 N., Rs. 3 and 4 W., the point of beginning.

Excepting and excluding from the effect of this proclamation the two privately owned tracts, hereinafter described:

(1) Lot 2, sec. 26, T. 9 N., R. 4 W.; and

(2) One acre more of less in the northwest quarter of sec. 35, T. 9 N., R. 4 W., more particularly described as follows:
Beginning at a point designated "A", on the line between secs. 26 and 35, T. 9 N., R. 4 w., from which the northwest corner of sec. 35 bears S. 89° 54' W., 1,550.0 ft. distant;
Thence from said point "A", south 326.0 ft.;
Thence along north bank of overflow,
N. 46° 30' E., 112.0 ft.;
N. 28° 45' E., 164.0 ft.;
N. 50° 56' E., 116.0 ft.;
Thence N. 36° 08' W., 40.0 ft., to the meander corner of 1 secs. 26 and 35, on west bank of overflow;
Thence S. 89° 54' W., 226.3 ft., on the line between secs. 26 and 35, to point "A", the place of beginning.

The Refuge area is shown upon Bureau of Biological Survey map filed in the archives of the Department of State, entitled "Bear River Migratory Bird Refuge," dated March 24, 1932, supplementing this proclamation.

It is unlawful within this Refuge to take, injure, or disturb any bird, or nest or egg thereof, or injure or destroy any notice, signboard, fence, dike, ditch, dam, spillway, improvement, or other property of the United States, or remove therefrom or cut, burn, injure, or destroy any grass or other natural growth

thereon, or enter,use, or occupy the refuge for any purpose, except in accordance with regulations prescribed by the Secretary of Agriculture.

Warning is given to all persons not to commit any of the acts herein enumerated, under the penalties prescribed in section 9 of the Bear River Migratory Bird Refuge Act of April 23, 1928 (45 Stat. 448, 450; U.S. Code, Supp., title 16, sec. 690g).

In witness whereof, I have hereunto set my hand and caused the seal of the United States to be affixed.

Done at the city of Washington this 26th day of September, in the year of our Lord nineteen hundred and thirty (SEAL) two, and of the Independence of the United States of America the one hundred and fifty-seventh.

HERBERT HOOVER

By the President:
Henry L. Stimson
Secretary of State

APPENDIX C

FEDERAL LAND ACQUISITION POLICIES

BEAR RIVER MIGRATORY BIRD REFUGE

FEDERAL LAND ACQUISITION POLICIES

1. All acquisitions of private property by the Federal Government are controlled by Fifth Amendment provisions of the Constitution which states "...nor shall private property be taken for public use, without just compensation." Under established law the criteria for just compensation is the fair market value of the property at the time of the acquisition. Fair market value is defined as "the amount of cash, or on terms reasonably equivalent to cash, for which in all probability the property would be sold by a knowledgeable owner willing but not obligate to sell to a knowledgeable buyer who is desires but not obligated to buy.: (Uniform Appraisal Standard for Federal Land Acquisition). In this connection, the Supreme Court has noted that "The value compensable under the Fifth Amendment, therefore, is only that value which is capable of transfer from owner to owner and thus of exchange for some equivalent. Its measure is the amount of that equivalent." The Court goes on to state: "If exchanges of similar properties have been frequent, the inference is strong that the equivalent arrived at by the haggling of the market would probably have been offered and accepted, and it is thus that the 'market price' becomes so important a standard of reference." Accordingly, it is the 'market price' which arises from the 'haggling of the market' which is being sought. In this connection, it should be borne in mind "...the Fifth Amendment allows the owner only the fair market value of his property; it does not guarantee him a return on his investment." (Uniform Appraisal Standard for Federal Land Acquisition). When the Service acquires only part of a single tract in one ownership, if the purchase diminishes the value of the remainder, the owner is entitled to compensations for the losses he suffers. These losses are commonly referred to as "severance damages." Landowners who experience diminution in value of their remaining property due to Service acquisition will be reimbursed according to applicable law and guidance.

2. Persons and businesses who are displaced through Government acquisition are eligible to receive certain benefits under the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646. The purpose as stated in the Act is "To provide for uniform and equitable treatment of person displaced from their homes, businesses, or farms by Federal and Federally assisted programs and to establish uniform and equitable land acquisition policies for Federal and Federally assisted programs." The entitlements include housing differential, moving expenses, and other incidental expenses involved in selling a property and/or in relocation. There are specific limits to the amount of relocation payments. These payments are in addition to the purchase price of the property and are

not taxable under Federal tax laws. Public Law 91-646 describes the entitlements and prerequisites required to establish eligibility. Relocation advisory service will be provided to all persons displaced by the acquisition of their property.

3. Acquisition would proceed along a willing-seller, funds available basis. There may be unique circumstances where a landowner has defective title to the land and in those situations, the government and the landowner would have to undertake a condemnation action against the title to allow for a clean sale. Since acquisitions would involve willing seller-willing buyer negotiations, the time frame for completion of the acquisition area will most likely be extended over a period of years for some tracts. It is possible that some tracts may not become available for purchase at anytime in the foreseeable future.

4. Land north of the Bear River and Forest Street would be acquired through wetland easements. Generally, the Service easement programs acquire a negative interest in the wetlands, placing limitations on the types of uses that a landowner can exercise on his property. The typical wetland protection easement prohibits the landowner from taking any action that would cause the draining, filling or levelling of any specified wetland on the property. The wetland easement is usually 'perpetual' in that it remains with the land regardless of any changes in ownership. In return for attaching the wetland easement to the land, the landowner is provided a one-time payment for the fair market value of the interests acquired. Payment is made only for the acreage of the easement wetlands, not for the entire acreage of the ownership. The easement is negotiated with the landowner in much the same fashion as a full-fee purchase and the landowner and negotiator designate which wetlands will be eased. The designated wetlands are then delineated on ownership maps and officially recorded when payment is made to the landowner.

5. Purchase of lands for the Preferred Action would proceed upon project approval by the Regional Director, U.S. Fish and Wildlife Service, the Migratory Bird Conservation Commission and/or specially legislated Congressional approvals. Any direct purchase of land or interests in land is dependent on the availability of funds as determined by Congressional funding actions. The time period from project approval to purchase of land from a contacted landowner will vary and depends upon title information, surveys, appraisals, negotiations and offers of purchase to the landowner.

The Fish and Wildlife Service reimburses Counties and/or other taxing authorities certain monies for revenue lost through the acquisition of private property. In

1978, an act entitled "National Wildlife Refuge System - Acreage Payments, Public Law 95-469" was passed by Congress. This law states "The Secretary (of Interior) shall pay out of the fund, for each fiscal year beginning with the fiscal year ending September 30, 1979 to each county in which is situated any fee area whichever amount is greater:

1. An amount equal to the product of 75 cents multiplied by the total of acreage of that portion of the fee area which is located within such county.

2. An amount equal to three-fourths of one per centum of the fair market value as determined by the Secretary, of that portion of the fee area (excluding any improvements thereto made after the date of Federal acquisition) which is located within such County.

3. An amount equal to 25 per centum of the net receipts collected by the Secretary in connection with the operation and management of such fee area during such fiscal year: but if a fee area is located in two or more counties, the amount each such county is entitled to shall be the amount which bears to such 25 per centum the same ratio as that portion of the fee area acreage which is within such county bears to the total acreage of such fee area...".

   The revenue sharing law also provides a mechanism for the Service to request of Congress supplemental funds to compensate local government for any shortfall in revenue sharing payments. Through this provision, the Secretary is mandated to request sufficient monies to make full payments to the governmental units.

APPENDIX D

WATER REQUIREMENT CALCULATIONS FOR ALTERNATIVES

BEAR RIVER MIGRATORY BIRD REFUGE

BEAR RIVER MIGRATORY BIRD REFUGE
WATER REQUIREMENTS CALCULATIONS
FOR PROPOSED ALTERNATIVES

I. INTRODUCTION

The Bear River Migratory Bird Refuge is located at the mouth of the Bear River, on the Bear River Bay, near Brigham City, Utah. The Refuge was established on April 23, 1928, for the purpose of preserving nesting, feeding, and resting habitat for waterfowl and other migratory birds. The Refuge receives almost its entire water supply from Bear River, with small quantities of runoff from adjacent lands. Water is used to fill and maintain impoundments constructed when the Refuge was established, and to fill and maintain wetlands outside the dikes surrounding these impoundments.

Historically, water management on the Refuge has been dictated by the natural flow of Bear River. Spring flows supply more water than can be retained by existing structures, while summer flows tend to be too low to maintain desirable pool elevations on constructed units. The Refuge holds a water right for 1000 cfs of Bear River water from January 1 to December 31, but this is often not available in late summer. Water management has also been dictated by the need to control avian botulism outbreaks, usually through the draining of some constructed impoundments. Flows occurring after the units have filled are used to offset evapotranspiration to maintain target levels and to provide circulation and flushing of the units and the wetlands outside the constructed dikes.

Proposed Alternative Actions

The purpose of this report is to present an analysis of historical water use on the Refuge, and the projected water use under the proposed actions evaluated by this Environmental Analysis (EA). Three of the four proposed actions evaluated by this EA would alter the historical water use on the Refuge.

A. The **No Action Alternative** would result in little or no management capability and no consumptive use beyond that of natural conditions; therefore, this option will not be discussed further in this report. Refuge water rights would not be used in a beneficial way, and the Service could lose the 1000 cfs water right currently held. Water quality could decrease due to grazing and agricultural activities on

adjacent private lands and salt water encroachment from the Great Salt Lake.

B. The **Restoration Alternative** would reconstruct the Refuge to preflood conditions. The calculated water requirements for this alternative are based on 50 years of historical gage heights recorded at the Refuge.

C. Under the **Enhancement Alternative**, construction of additional dikes would allow enhanced manipulation of water resources, increasing consumptive use. In addition, existing diversion channels would be enlarged to accommodate the 25-year runoff event, protecting water control structures from flood damage.

D. Under the **Expansion Alternative**, additional dikes would be constructed on Fee Title lands, increasing the area of manageable open water, hence, consumptive use.

II. REFUGE WATER MANAGEMENT SYSTEM

The Bear River flow into the Refuge is regulated by releases from the Cutler Dam and consists of flow held in storage or remaining from a 900 cfs water right at that point. Inflow to the Bear River below the Cutler Dam is minimal, with Malad River being the only major tributary. Some minor tributaries along the river near Brigham City are used by several private duck hunting clubs.

A. Refuge Units

The main part of the Refuge consists of five water management units surrounded by dikes. The description below originates from the Refuge's 1959 Water Management Plan. It assumes units are full, in preflood condition, salts flushed, and vegetation reestablished.

1. Unit 1 is located to the northwest of Unit 2, and consists of 6450 acres (including subunit 1a) up to the 4206 ft elevation contour as the northern boundary. Unit 1a, located on the eastern side of Unit 1, consists of 520 acres of ponds and emergents.[1]

[1]In the description, it was assumed that marsh and emergent vegetation occurred in water less than one foot deep. These areas have the same evapotranspiration coefficient of ponds and emergents.

2. Unit 2 is west of Unit 3, and consists of 5,608 acres and includes subunits and all the area within its surrounding dikes. Units 2a and 2b are located at the northern end of Unit 2. Unit 2a consists of 130 acres of ponds and emergents; Unit 2b consists of 240 acres of ponds, emergents, and uplands.

3. Unit 3 is west of Unit 4, and consists of about 6,300 acres, including subunit 3a and the area within its surrounding dikes. Unit 3a, at the northern end of Unit 3, consists of 100 acres of interspersed vegetation.

4. Unit 4 is west of Unit 5, and consists of 3,734 acres within its surrounding dikes.

5. Unit 5 is located on the eastern side of the Refuge, and consists of 4,950 acres as delineated by the 4,206 ft elevation contour as the northern boundary.

B. Water Supply System

Water is supplied to the Refuge through three major points of diversion: Reeders Overflow Canal, Whistler Canal, and the river control gates at the old headquarters site. In addition, Box Elder Creek supplies up to 50 cfs to Unit 5 in the spring, and, downstream from Whistler Canal on the Bear River channel, overflows Nos.1 and 2 supply water to Unit 3.

The first diversion into the Refuge is the Reeders Overflow Canal, which follows the route of an old natural overflow channel and provides water to Unit 5. Control of flow in the canal is accomplished through an 80-foot, five-bay structure, consisting of five 16-foot radial gates. The canal terminates in Unit 5, in an east and a west lateral canal. The approximate capacity of Reeders Overflow is 1,000 cfs.

West of Reeders Overflow, Whistler Canal can diverts water at about 200 cfs through a two-bay radial gate structure leading to a 30-foot wide canal. This canal ends at a three-way structure located at the northern end of the dike separating Units 4 and 5. An east lateral canal at this structure can transport water to Unit 5, and a west lateral can carry water to Unit 4.

The No.2 overflow canal can carry about 50 cfs, and is used to fill Unit 3 via a 16-foot radial gate structure. No.1 overflow canal, just upstream

from No.2, is also used to fill Unit 3 via a 15-foot wide, three-bay stoplog structure.

The River Control structure is located at the junction of Units 1 and 2. A seven-bay and a five-bay (16-foot radial gates) spillway lead into Unit 2, and a two bay spillway leads into the L-line canal. In addition, when the River's surface elevation exceeds 4,206.0 feet msl, a 150-foot wide concrete spillway allows water to flow into Unit 1a. The L-line canal parallels the L-line dike separating Units 1 and 2, and can carry up to 150 cfs to the west side of Subunit 1a into Unit 1 or Subunit 1a.

Outlet facilities consist of stoplog structures on the D-line dike surrounding the units, and one culvert for Unit 1. These major outlet structures, along with inlet structure dimensions and invert elevations, are listed in Table 1, and shown in Figure 1. This description does not include minor culvert and stoplog structures that allow internal water manipulation within the units.

III. HISTORICAL WATER USE

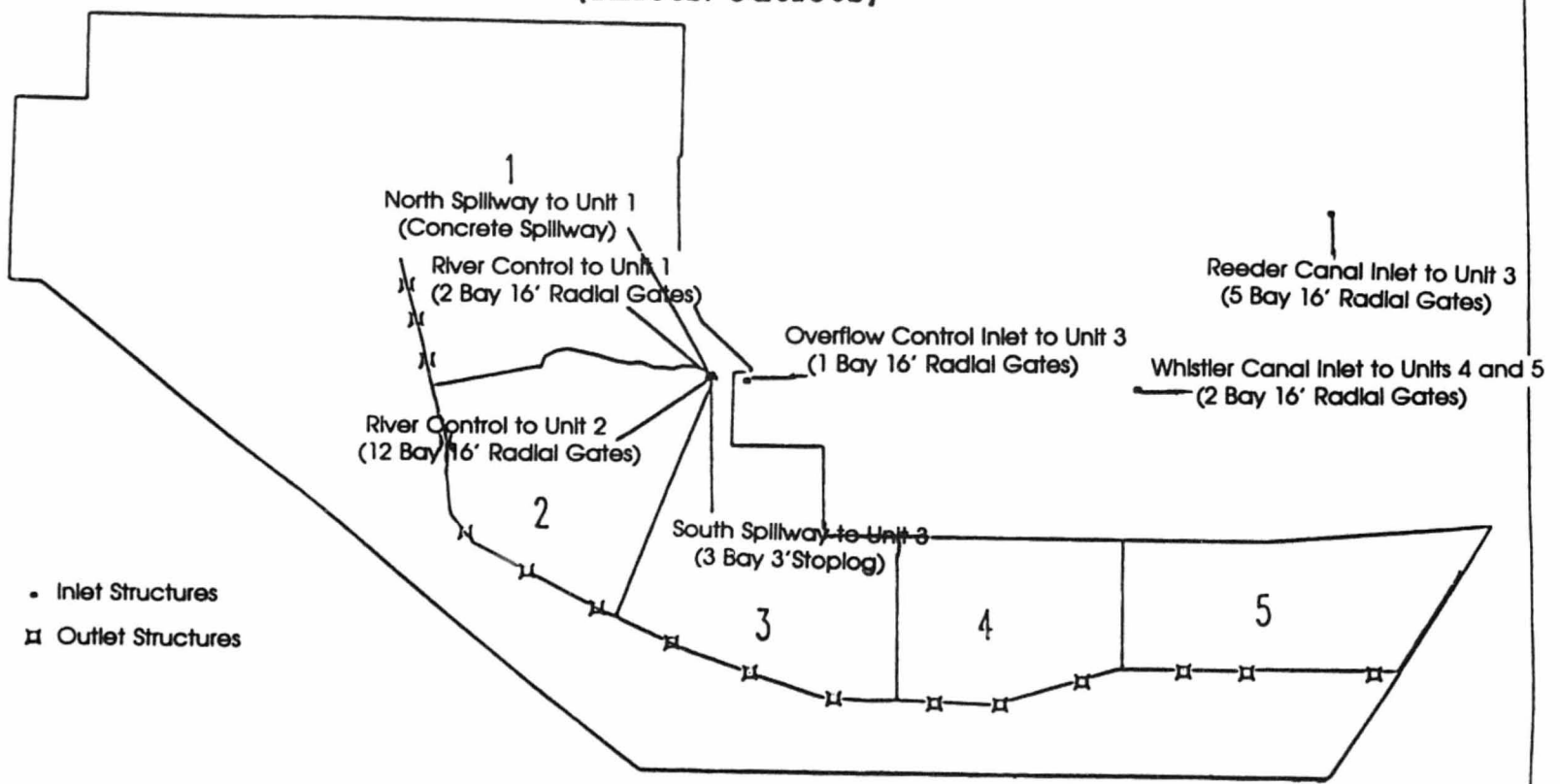
To analyze the historical water use at the Refuge, a review of all previous water use studies was conducted, annual water management plans from 1943 to 1978 were reviewed, and a database was created using 1932 to 1983 water level readings. In addition, precipitation and evaporation records from the Refuge weather station and Bear River flow records from the Corinne, Utah, U.S. Geological Survey gaging station were analyzed.

TABLE 1. BEAR RIVER WATER CONTROL STRUCTURES

INLET STRUCTURES			
Unit	**Width(ft)**	**Type**	**Invert Elev.(ft)**
1	32	2 Bay 16' Radial Gates	4203.0
1a	150	Concrete Spillway	4206.0
1	192	12 Bay 16' Radial Gates	4200.0
2	15	3 Bay 5' Stoplogs	4201.0
3	16	1 Bay 16' Radial Gates	4203.0
4,5	32	2 Bay 16' Radial Gates	4204.0
5	80	5 Bay 16' Radial Gates	4205.0

Figure 1

Bear River Migratory Bird Refuge
Major
Water Control Structures
(inlets/outlets)



OUTLET STRUCTURES

Unit	Width(ft)	Type	Invert Elev(ft)
1	54	9 Bay Stoplog	4201.0
	18	3 Bay Stoplog	4201.0
	3	Culvert	4201.0
2	54	9 Bay Stoplog	4201.0
	54	9 Bay Stoplog	4201.0
	18	3 Bay Stoplog	4201.0
	18	3 Bay Stoplog	4201.0
3	36	6 Bay Stoplog	4201.0
	18	9 Bay Stoplog	4201.0
	18	3 Bay Stoplog	4201.0
4	18	3 Bay Stoplog	4201.0
	18	3 Bay Stoplog	4201.0
	18	3 Bay Stoplog	4201.0
5	72	12 Bay Stoplog	4201.0
	36	6 bay Stoplog	4201.0
	18	3 Bay Stoplog	4201.0

A. Historical Operation

Historically, all units were filled in the spring, as soon as the ice broke up on the units, usually March. However, unit order varied from year to year, especially in the 1940's, when extensive botulism research was being conducted, and there was no set system of priorities. Units were generally filled to elevation 4,205.0 ft, flushed, and refilled to the management level. Water flushed from the units and spring flows occurring afterwards helped flush the area south of the D-line Dike, and filled approximately one-half of this acreage, creating shallow pools surrounded by temporary wetlands. Water levels inside the D-line were maintained as long as adequate water was available, with some pools being drained to provide water to other pools or to reduce severity of botulism outbreaks. In late September, or early October, the units were

again flushed, and refilled to management levels adequate for resting habitat for migrating waterfowl and for hunter access. The units were drained just prior to, or just after, ice-up in November to avoid ice damage to water control structures and were maintained at these low levels until the following spring.

B. Previous Studies

Previous analyses of water needs were conducted by the U.S. Fish and Wildlife Service (1953, 1954, 1978), the Bureau of Reclamation (1954, 1966-67, 1970), and the Utah Department of Natural Resources (DNR), Division of Water Resources (1988), in an attempt to determine whether enough water was available for additional development on the lower Bear River. Development proposals consist of several possible storage reservoirs upstream of the Refuge, and are best described in the 1988 DNR "Overview of the Lower Bear River Development Plan". Water Requirements developed in these studies are listed in Table 2. The wide range of values in this Table are indicative of the differences in purpose for which they were developed. Many assumptions had to be made in developing these numbers and the current analysis. These assumptions are discussed as each part of the current analysis is presented.

C. Method of Analysis: Historical Water Use

A dBase file was created using all available water level data contained in Refuge files (1932-1983). Because scheduling of the readings was discontinuous, the data was used to develop median monthly values. It was assumed that these median monthly water levels were attained at the beginning of each month, maintained throughout the month, and the next month's level obtained at the beginning of the following month. It was also assumed that all units were flushed twice each year, once in March and once in October, and that they were drawn down in November.

Evaporative losses were assumed to occur from March through October, and were estimated at 85% of Standard Class Pan A evaporation on all areas of open water (submergent habitat) greater than 1 foot deep. Evapotranspiration was estimated at 125% of Standard Class Pan A Evaporation on all areas of marshland (emergent habitat), which included all areas covered with water less than 1 foot deep. A review of literature concerning evaporation and transpiration resulted in an array

TABLE 2. RESULTS OF PREVIOUS STUDIES

Year	Source	Annual Refuge Water Requirements
1953	FWS	483,598 acre feet
1954	Bureau of Reclamation	357,900 acre feet
1954	Bureau of Reclamation	350,600 acre feet
1954	FWS	453,100 acre feet
1956	Joint Agreement: FWS and Bureau of Reclamation	341,400 acre feet
1966-7	Bureau of Reclamation	341,000 acre feet
1970	Bureau of Reclamation	218,000 acre feet (available w/in pattern of need)
1978	FWS	287,400 acre feet (available w/in pattern of need)
1978	FWS	760,400 acre feet (available w/in pattern of need)
1988	Utah DNR	405,400 acre feet (281,000 available w/in pattern of need)

of values and equations which could be used, most of which differed only slightly in the total seasonal evaporation. Based on this review and the fact that these values have been used in several of the previous investigations, it was felt that they were reasonable. Area-capacity tables developed for the units inside the D-line dike were used to determine the areas of open water and marsh.

Evaporation and evapotranspiration figures were derived from the Bear River Refuge weather station data (1948-1984), and median monthly pan evaporation was calculated. These values were subtracted from the median monthly precipitation, also derived from Bear River Refuge weather station data, and used to calculate the volume of water needed to maintain pools and wetlands. Area-capacity tables for the units were used to calculate the volumes of water needed to fill and maintain the pools at the historical water level elevations. The existing delivery system (described above) was estimated to be 70% efficient, based on previous experience with similar earthlined canal irrigation systems.

The median monthly historical flow of Bear River was derived from gaging data from the U.S. Geological Survey gaging station at Corinne, Utah (1939-1983). Gaging data was extrapolated from 1939 to 1948 (when the station was established) using a correlation developed by Dr. Norman Stouffer of the Utah DNR, Division of Water Resources and based on data from the Collinston gage upstream. Since flow in July and August was found inadequate for maintaining all units at full pool elevations, two units (3 and 5) were allowed to dry during those months. Although the historical water level data for the units does not definitely indicate which units were historically allowed to dry during the late summer, Units 3 and 5 were dry the largest percentage of the time, and would be the most difficult to maintain due to the delivery system configuration. Also, the area outside the D-line dike was not maintained (i.e., no flow was assumed to reach this area to offset evapotranspiration). In September, when flows historically begin to increase, Units 3 and 5 were allowed to refill. When water became available in October, all units were filled and flushed, and excess water was used to maintain the area below the dike.

D. Results: Historical Water Use (Restoration Alternative)

Table 3 presents the results of the water requirements analysis based on the historical water level data. The total volumes for all units were added to the volume of water calculated to be needed to offset evapotranspiration on the area outside the D-line dike. The amount needed to offset evapotranspiration outside the D-line was doubled to ensure an adequate freshwater balance for the health of the outlying vegetation. The total was adjusted for delivery efficiency to arrive at the total water requirement.

Table 7 presents the median monthly discharge for Bear River at Corinne, Utah, compared with calculated monthly water use at the Refuge. This data is presented graphically in Figure 2. The median discharge exceeds calculated historical use in all months except July. A deficit of 3,440 acre feet in July is due to the use of median values, both in the gage heights and in the discharge, and is less than 1.1 percent of the calculated total annual use. Use of daily values would probably eliminate much of this discrepancy. The lower part of Table 7 lists the probabilities of specific flows for Bear River at Corrinne. The total calculated median historical use at the Refuge would be available in the river more than 98 percent of the time.

TABLE 3 BEAR RIVER MBR MEDIAN VALUES FOR 1932 - 1983

UNIT 1 MONTH	MEDIAN GAGE HT	SUBMERGENT AREA AC	TOTAL CAPACITY AC-FT	P-85%ET INCHES	EMERGENT AREA AC (1)	P-125%ET INCHES	FILL AC-FT	MAINTAIN SUBMERGENT AC-FT (2)	MAINTAIN EMERGENT AC-FT (2)	TOTAL AC-FT
JAN	4.37	1240	3110							
FEB	4.19	880	2412							
SPRING FLUSH/FILL (3)							5948			5948
MAR	4.55	1630	3859	0.89	2650	1.53	3859	121	338	4318
APR	4.70	2020	4519	1.61	2500	2.64	660	271	550	1481
MAY	4.76	2176	4794	3.89	2440	5.41	275	705	1100	2080
JUN	4.80	2280	4979	5.91	2400	7.75	185	1123	1550	2858
JUL	4.70	2020	4519	8.65	2500	10.83		1456	2256	3712
AUG	4.70	2020	4519	7.42	2500	9.43		1249	1965	3214
SEP	4.73	2098	4656	3.87	2470	5.17	137	677	1064	1878
FALL FLUSH/FILL							5948			5948
OCT	4.76	2176	4794	1.07	2440	1.78	4794	194	362	5350
NOV	4.70	2020	4519							
DEC	4.52	1552	3732							
TOTALS							21806	5796	9185	36787

UNIT 2 MONTH	MEDIAN GAGE HT	SUBMERGENT AREA AC	TOTAL CAPACITY AC-FT	P-85%ET INCHES	EMERGENT AREA AC	P-125%ET INCHES	FILL AC-FT	MAINTAIN SUBMERGENT AC-FT	MAINTAIN EMERGENT AC-FT	TOTAL AC-FT
JAN	4.40	2240	5315							
FEB	4.30	2080	4854							
SPRING FLUSH/FILL							8283			8283
MAR	4.41	2256	5362	0.89	2390	1.53	5362	167	305	5834
APR	4.60	2800	6258	1.61	2020	2.64	896	376	444	1716
MAY	4.65	3000	6501	3.89	1880	5.41	243	973	848	2063
JUN	4.74	3360	6945	5.91	1620	7.75	444	1655	1046	3145
JUL	4.65	3000	6501	8.65	1880	10.83		2163	1697	3859
AUG	4.68	3120	6648	7.42	1796	9.43	147	1929	1411	3488
SEP	4.70	3200	6746	3.87	1740	5.17	98	1032	750	1880
FALL FLUSH/FILL							8283			8283
OCT	4.74	3360	6945	1.07	1628	1.78	6945	300	241	7486
NOV	4.66	3040	6550							
DEC	4.49	2384	5736							
TOTALS							30701	8594	6742	46037

(1) Emergent area equals total surface area flooded minus submergent area.
(2) Total inches offset by evapotransporation times surface aces divided by 12.
(3) In FLUSH/FILL all units were filled to 4205.00 ft msl, drawn down and refilled to management level.

TABLE 3 cont. BEAR RIVER MBR MEDIAN VALUES FOR 1932 - 1983

UNIT 3 MONTH	MEDIAN GAGE HT	SUBMERGENT AREA AC	TOTAL CAPACITY AC-FT	P-85%ET INCHES	EMERGENT AREA AC	P-125%ET INCHES	FILL AC-FT	MAINTAIN SUBMERGENT AC-FT	MAINTAIN EMERGENT AC-FT	TOTAL AC-FT
JAN	4.37	901	2565							
FEB	4.20	510	1953				5588			5588
SPRING FLUSH/FILL							3215	96	383	3694
MAR	4.53	1296	3215	0.89	3000	1.53	776	247	660	1683
APR	4.70	1840	3991	1.61	3000	2.64	197	638	1353	2187
MAY	4.74	1968	4188	3.89	3000	5.41	512	1127	1938	3576
JUN	4.84	2288	4700	5.91	3000	7.75	0	0	0	0
JUL	1.00	0	0	8.65	0	10.83	0	0	0	0
AUG	1.00	0	0	7.42	0	9.43	3991	593	1293	5877
SEP	4.70	1840	3991	3.87	3000	5.17	5588			5588
FALL FLUSH/FILL							4288	181	445	4914
OCT	4.76	2032	4288	1.07	3000	1.78				
NOV	4.70	1840	3991							
DEC	4.50	1200	3087							
TOTALS							24155	2882	6070	33107

UNIT 4 MONTH	MEDIAN GAGE HT	SUBMERGENT AREA AC	TOTAL CAPACITY AC-FT	P-85%ET INCHES	EMERGENT AREA AC	P-125%ET INCHES	FILL AC-FT	MAINTAIN SUBMERGENT AC-FT	MAINTAIN EMERGENT AC-FT	TOTAL AC-FT
JAN	4.34	350	1400							
FEB	4.28	293	1251				3515			3515
SPRING FLUSH/FILL							729	54	307	1090
MAR	4.60	729	2152	0.89	2404	1.53	229	129	508	866
APR	4.70	958	2472	1.61	2309	2.64	137	355	1151	1642
MAY	4.76	1095	2670	3.89	2552	5.41	184	630	1409	2222
JUN	4.84	1279	2942	5.91	2181	7.75		740	2058	2798
JUL	4.73	1027	2570	8.65	2280	10.83		521	1852	2373
AUG	4.65	843	2310	7.42	2357	9.43	115	309	995	1419
SEP	4.70	958	2472	3.87	2309	5.17	3515			3515
FALL FLUSH/FILL							1004	90	340	1433
OCT	4.72	1004	2537	1.07	2289	1.78				
NOV	4.65	843	2310							
DEC	4.40	406	1559							
TOTALS							9428	2827	8618	20873

TABLE 3 cont. BEAR RIVER MBR MEDIAN VALUES FOR 1932 - 1983

UNIT 5 MONTH	MEDIAN GAGE HT	SUBMERGENT AREA AC	TOTAL CAPACITY AC-FT	P-85%ET INCHES	EMERGENT AREA AC	P-125%ET INCHES	FILL AC-FT	MAINTAIN SUBMERGENT AC-FT	MAINTAIN EMERGENT AC-FT	TOTAL AC-FT
JAN	4.36	1634	3421							
FEB	4.30	1520	3216							
SPRING FLUSH/FILL							5931			5931
MAR	4.63	2105	4432	0.89	1799	1.53	4432	156	229	4817
APR	4.76	2311	4946	1.61	1697	2.64	514	310	373	1197
MAY	4.80	2374	5107	3.89	1666	5.41	161	770	751	1682
JUN	4.84	2437	5269	5.91	1635	7.75	162	1200	1056	2418
JUL	1.00	0	0	8.65	0	10.83	0	0	0	0
AUG	1.00	0	0	7.42	0	9.43	0	0	0	0
SEP	4.76	2311	4946	3.87	1697	5.17	4946	745	731	6422
FALL FLUSH/FILL			0				5931			5931
OCT	4.75	2295	4906	1.07	1705	1.78	4906	205	253	5364
NOV	4.66	2153	4549							
DEC	4.35	1615	3386							
TOTALS							26983	3386	3394	33763

OUTSIDE D-LINE	SUBMERGENT AREA AC	P-85%E INCHES	EMERGENT AREA AC	P-125%E INCHES	MAINTAIN SUBMERGEN AC-FT	MAINTAIN EMERGENT AC-FT	TOTAL (DOUBLED) AC-FT
MAR	7600	0.89	7600	1.53	564	969	2096
APR	7600	1.61	7600	2.64	1020	1672	3711
MAY	7600	3.89	7600	5.41	2464	3426	8354
JUN	7600	5.91	7600	7.75	3743	4908	12394
JUL	7600	8.65	7600	10.83	0	0	0
AUG	7600	7.42	7600	9.43	0	0	0
SEP	7600	3.87	7600	5.17	2451	3274	8176
OCT	7600	1.07	7600	1.78	678	1127	2483
TOTALS	OUTSIDE D-LINE				10919	15377	37215

MAINTAIN
TOTAL
170567 SUM OF 5 UNITS

70%
DELIVERY 243667 INSIDE D-LINE
EFFICIENCY + 53163 OUTSIDE D-LINE

296831 TOTAL

FIG 2. BEAR RIVER MBR HISTORIC WATER USE VS. BEAR RIVER FLOW

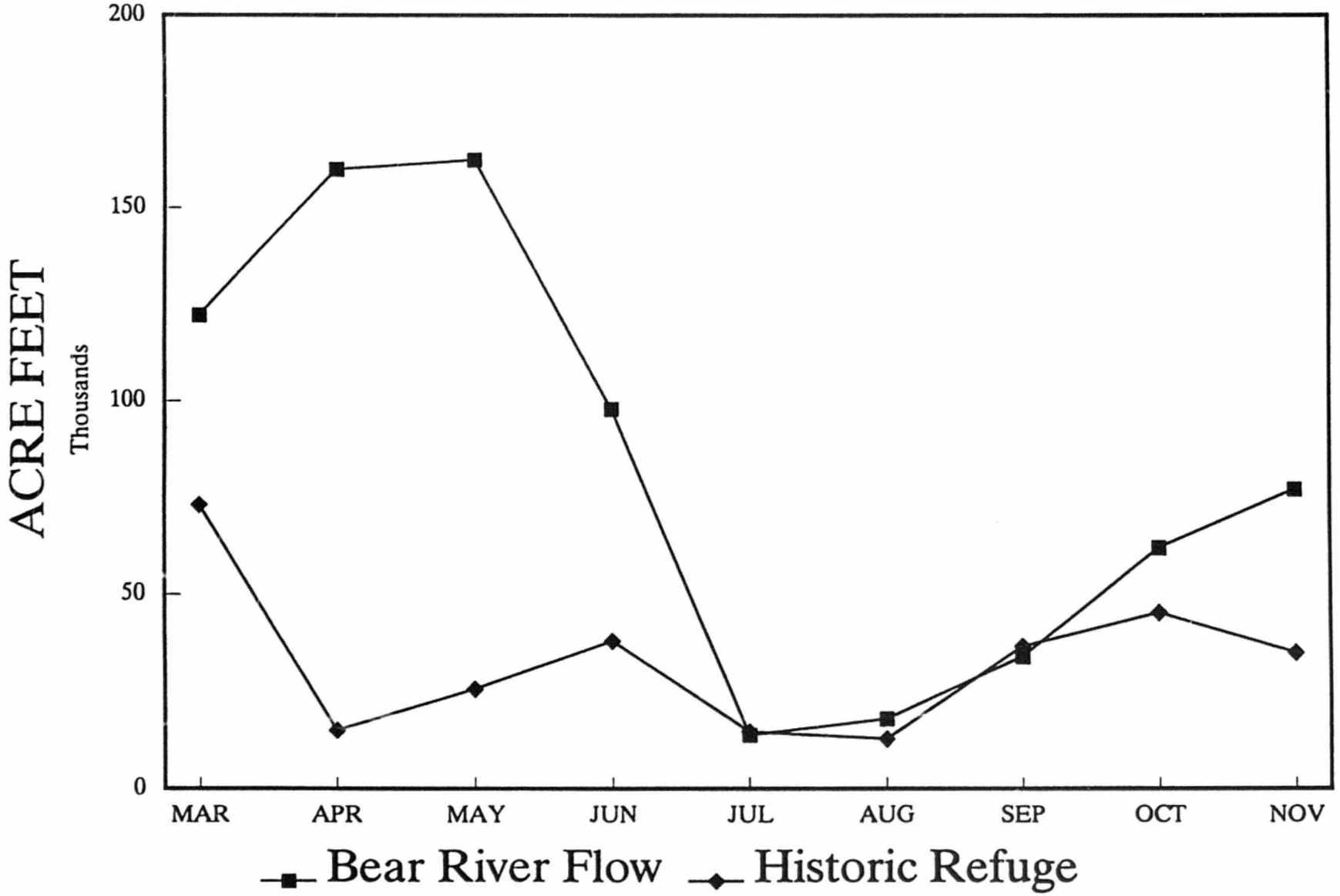


TABLE 4. BEAR RIVER MBR MONTHLY WATER USE AND AVAILABILITY, 1943

MONTH	BEAR RIVER FLOW (AC-FT) AT CORRINNE, UT	TOTAL 1943 REFUGE USE	DIFFERENCE AC-FT
MAR	123784	56737	67047
APR	222019	34735	187284
MAY	145277	28602	116675
JUN	137030	42145	94884
JUL	19976	28234	-8258
AUG	16056	24802	-8747
SEP	23803	19147	4656
OCT	68267	48803	19464
NOV	76924	41807	35117
TOTALS	833135	325012	
DEFICIT			-17005

Since the assumptions made and the use of median values resulted in an estimated median water use at the Refuge, determined by actual water availability, an attempt was made to determine how much water could have been used had it been available. An analysis of the Bear River flow data and the unit gage height data indicated that significantly more water was available in 1943 than the median flow quantity examined above. The 1943 median gage heights were analyzed in the same fashion as were the historic median gage heights to determine water use in 1943. In this analysis, actual precipitation values were used to calculate maintenance water needs. Evaporation data was not available for 1943, so median values were used. A summary of this analysis is presented in Table 4, which indicates that the Refuge used 325,012 acre feet of water. This is 109 percent of the amount estimated for median refuge use, and represents the estimated maximum water use the Refuge was capable of using with historical water control structures.

Table 4 compares calculated water use in 1943 with the total monthly flow. Deficits are indicated in July and August, again because median gage heights were used, but also because the median Class A Standard Pan Evaporation was used to calculate maintenance water needs. The median evaporation is probably somewhat greater than the actual evaporation in 1943. However, available water exceeded estimated water use in all other months, indicating that the Refuge might have been able to utilize even more water had it been available in the summer.

IV. ENHANCEMENT ALTERNATIVE WATER REQUIREMENTS

A. Method of Analysis

If the Refuge is enhanced according to Alternative 3, greater water management capability will be achieved, and a greater diversity of habitat types can be developed and maintained. A summary of ideal water management and habitat types is summarized below:

1. **Emergent Marsh**
   Water depths up to 18 inches deep, with 50% emergent vegetation cover.
   a. Purpose
      i. Provide waterfowl nesting and brood cover.

ii. Provide nesting habitat for a wide variety of other migratory birds.
iii. Provide winter cover for resident wildlife.

b. Management

i. Flush salts during the fall, winter, and spring.
ii. Fill to operational level in spring and maintain throughout summer and fall until freeze-up.
iii. Draw down a proportion on 5-year intervals throughout the entire growing season to promote productivity.

c. Acres

18,600 (inside and out of D-Line)

2. Submergent Marsh

Water depths of 6 inches to 3 feet, 90% open water, 10% emergent vegetation coverage.

a. Purpose

i. Provide an abundance of submergent marsh vegetation to be used as a food source for migratory birds.
ii. Serve as a summer molting area for both ducks and geese.
iii. Act as a staging area during both spring and fall migrations.

b. Management

i. Flush salts during the fall, winter, and spring.
ii. Fill to operational levels in spring and maintain throughout summer and fall freeze-up.
iii. Draw down a proportion on 5 to 7 year intervals throughout the entire growing season to promote productivity.

c. Acres

23,800 (inside and out of D-Line)

3. Mudflat

Water depth 0 to 2 inches, bare soil (no vegetative cover).

a. Purpose

i. Provide shorebird nesting, feeding and loafing sites.
ii. Mudflats located great distances from other marshes provide loafing sites for geese.

b. Management

Flush salts during the fall and spring.

c. Acres

30,400 (Northwest corner of Refuge)

Under this alternative, the same assumptions concerning evaporation and maintenance of water levels were made. Again, it was assumed

that at least one unit would remain dry following spring flushing. Twenty percent of the water that would have been used to fill and maintain submergent and emergent habitat was subtracted from the total volume of water needed to fill and maintain the pools. Submergent habitat in Table 5 would be filled to an elevation of 4205 ft in March, then emptied and refilled to the management level (18 inches). In August, with the highest incidence of botulism outbreaks, units would be filled, flushed and refilled. Again in November, pools would be completely filled and flushed of salts and toxins, then raised to an average depth of 18 inches, to provide resting habitat for migrating waterfowl and hunter access. Pools would be drawn down to the historical winter level in December to prevent ice damage, and maintained at that level until ice-out in March. Twelve inches of water would be applied to emergent marsh in spring, fall, and winter with the same procedure used in the submergent pools. Also, it was assumed that the mudflats would be flushed with approximately 2 inches of water in the spring and fall.

The Enhancement Alternative originally included plans to install a bypass canal on the east side of the existing units. However, the dikes have not been breached by any historical river flows. Instead of a bypass canal, the Refuge is examining the enlargement of several diversions to make them sufficient to pass the 25-year runoff event.

B. Results

Water use under the Enhancement Alternative was evaluated with the assumption that adequate flow would be available throughout the year. The results of this analysis are presented in Table 5. Flow in Bear River exceeds the table's total amount 94 percent of the time (Table 7), an increase of 270,406 acre feet over historical use. The deficit in the Bear River water supply totals 238,115 acre feet during the months of July, August, and November under the Enhancement Alternative. This data and the Bear River monthly median flow data are presented graphically in Figure 3 and in tabular form in Table 7. Figure 3 depicts water use for the Refuge under the Enhancement Alternative with and without the addition of the fee title lands (the Expansion Alternative).

With enhanced management capability, additional flushing would be possible due to the smaller size of the units. It will take several years of flushing the units with fresh water to remove the salts accumulation in the soil due to the flooding, and additional flushing would be beneficial

in soil and water quality maintenance. Flushing would not only increase productivity of the pool units, but would help maintain the salt balance of the area surrounding the dikes as well as the State managed wildlife areas south of the Refuge. It would also help maintain the salt/freshwater interface boundary, protecting groundwater supplies on nearby private lands.

V. REQUIREMENTS UNDER THE EXPANSION ALTERNATIVE

A. Method of Analysis

Under the Expansion Alternative, the Service would acquire 16,891 acres of Fee Title lands and 21,109 acres of easement lands. The Fee Title lands would be enhanced through construction of additional dikes, creating approximately 8,500 acres of additional wetland habitat (Figure 4). An additional 8,400 upland acres of this acquisition would be suitable for a new visitor center. Habitat types for the Fee Title land and the associated ideal water management is summarized below:

1. **Emergent Marsh**
   4,800 additional acres would be acquired just north of the five historical units (Figure 4). This habitat is described under the Enhancement Alternative.

2. **Wet Meadow**
   Irrigated upland vegetation.
   - **a. Purpose**
     - i. Provide high quality nesting cover for migratory birds.
     - ii. Provide both food and cover for resident wildlife use.
   - **b. Management**
     - i. Plant grass/legume mixes on upland soils and maintain the vegetation by irrigating.
     - ii. Irrigate between March 15 and June 1 to point of saturation.
     - iii. Halt irrigation between June 1 and August 15 to promote nesting.
     - iv. Irrigate one to two more times after August 15 to allow fall regrowth.
   - **c. Acres**
     7000

3. Prairie Wetlands

Diversity of wetland basins interspersed in grasslands; water depths up to 4 feet in stream channels.

a. Purpose

i. Provides a variety of habitats benefiting all species of nesting waterfowl and nearly all other migratory birds.
ii. Provide excellent food and cover for resident wildlife.
iii. Provides staging habitat for waterfowl.

b. Management

i. Water levels maintained by flowing springs and high water tables.
ii. Provide supplemental water during dry periods.
iii. Maintain desired water levels by installing dikes and stoplog structures.
iv. Control marsh and upland vegetation to maintain plant vigor.

c. Acres

1500

The evaluation of water requirements under this alternative used the same assumptions concerning precipitation, evaporation, and pool elevation management used in the Enhancement Alternative evaluation. Water requirements for irrigated upland vegetation were calculated using the Soil Conservation Service consumptive use rates in that region for the mix of grass and alfalfa. The wet meadow habitat will be flushed in the spring, fall, and winter with approximately 6 inches of water.

B. Results

According to the Expansion Alternative, water need is 653,712 acre feet, 86,475 acre feet beyond what is needed under the Enhancement Alternative. This amount of water would be available in Bear River at least 84 percent of the time (Table 7). Again, this method allows for 20 percent of the units within the D-Line dike area to dry up. Tabular results of the analysis are presented in Table 6, and graphically depicted with median Bear River flows in Figure 2.

This evaluation also assumes that adequate flow would be available throughout the summer to maintain all pools and emergent vegetation. Although a 35 cfs water right would accompany the Fee Title lands acquisition, this would not increase the actual flow available in Bear

TABLE 5. ENHANCED ALTERNATIVE WITH CROSS DIKES: IDEAL WATER MANAGEMENT

	EMERGENT MARSH AC	P-125%ET IN	FILL & MAINTAIN AC-FT	SUBMERGENT MARSH AC	P-85%ET IN	FILL & MAINTAIN AC-FT	FLUSH** TO 4205 FT	MUDFLATS AC	2"FLUSH AC-FT
REFILL	12000	12.00*	12000	16200	18.00*	24300	29265	30400	5067
MAR	12000	1.53	1530	16200	0.89	1202			
APR	12000	2.64	2640	16200	1.61	2174			
MAY	12000	5.41	5410	16200	3.89	5252			
JUN	12000	7.75	7750	16200	5.91	7979			
JUL	12000	10.83	10830	16200	8.65	11678			
REFILL	12000	12.00*	12000	16200	18.00*	24300	29265		
AUG	12000	9.43	9430	16200	7.42	10017			
SEP	12000	5.17	5170	16200	3.87	5225			
OCT	12000	1.78	1780	16200	1.07	1445			
REFILL	12000	12.00*	12000	16200	18.00*	24300	29265	30400	5067
TOTALS			80540			117869	87795		10134

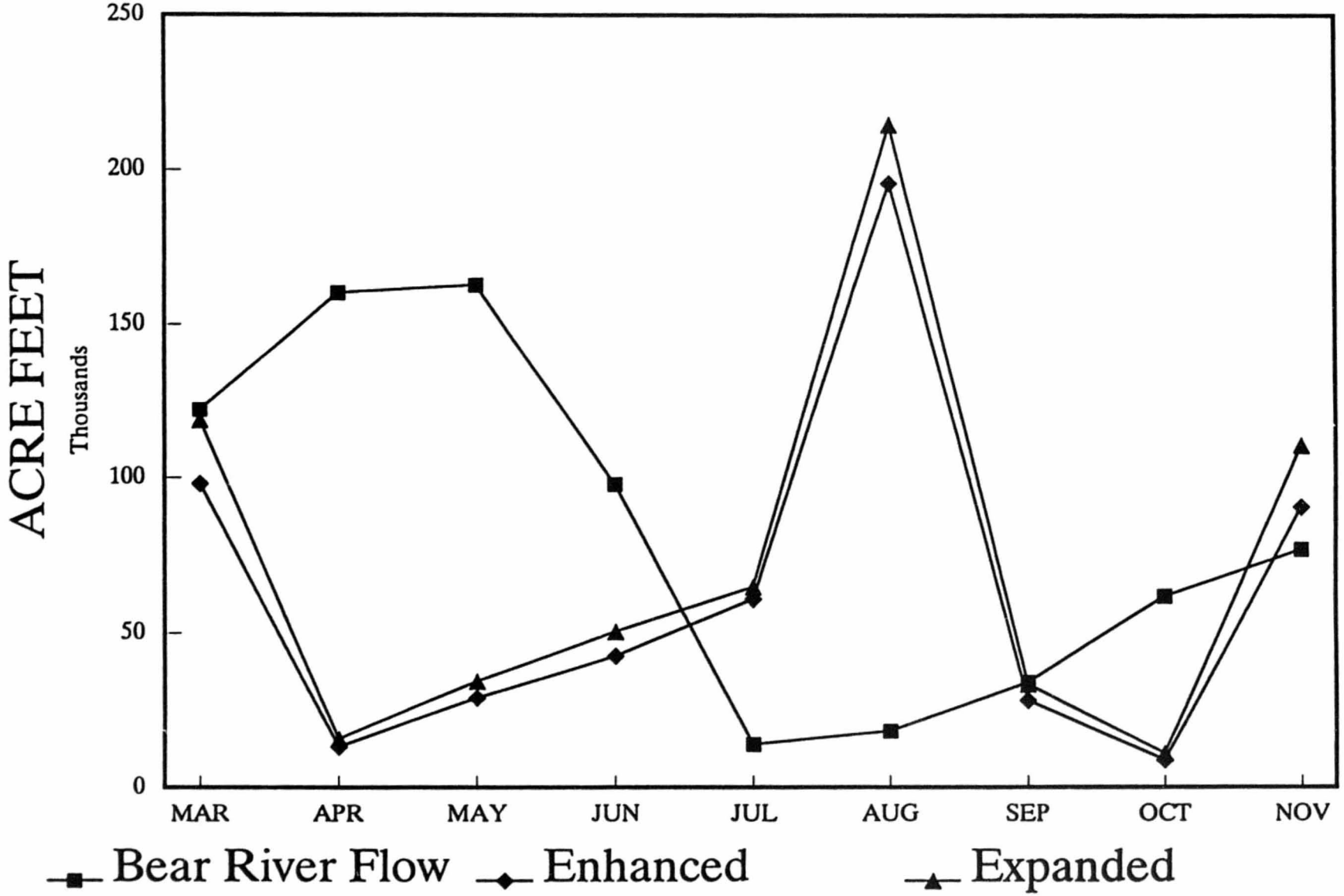
* Inches needed to fill to management levels.
** Flush includes both submergent and emergent areas.

	BELOW D-LINE EMERGENT AC	MAINTAIN AC-FT	BELOW D-LINE SUBMERGENT AC	MAINTAIN AC-FT
MAR	7600	1938	7600	1127
APR	7600	3344	7600	2039
MAY	7600	6853	7600	4927
JUN	7600	9817	7600	7486
JUL	7600	13718	7600	10957
AUG	7600	15200	7600	26600
SEP	7600	11945	7600	9399
OCT	7600	6549	7600	4902
NOV	7600	2255	7600	1355
TOTAL		71617		68793

DRY	
20% OF SUBMERGENT	436747
AND EMERGENT MARSH	- 39682

	397065
AFTER	
70% DELIVERY	
EFFICIENCY =	567236
	TOTAL USE
	ACRE-FEET

FIG 3. BEAR RIVER MBR ALTERNATIVE WATER VS. BEAR RIVER FLOW



River. The total deficit of Bear River's water supply is 280,573 acre feet during the months of July, August, and November under the Expansion Alternative. Refinement of the water management plans and proposed structure designs may result in enhanced control and maintenance of Refuge water resources. It is anticipated that water management under this Alternative will result in optimal use of all available Bear River flow.

Under the Expansion Alternative, the Refuge would have the capability of retaining and utilizing a greater volume of the Bear River flow than has been possible historically. Water unused by the Refuge flows into the Great Salt Lake, maintaining the fresh/salt water balance in the northeast corner of the lake. This freshwater inflow is vital to the wildlife production areas managed by the State south of the Refuge. However, the increased volume of water utilized by the Refuge is unlikely to have a significant impact on the fresh/salt water balance for two reasons. First of all, the majority of flow through occurs in the spring, which would not be reduced much by the expansion of the Refuge. Secondly, the Refuge would continue to flush the areas within and without constructed dikes. This water would help maintain the fresh/salt water balance to the south of the Refuge, providing adequate water to support wildlife needs.

VII. CONCLUSIONS

A. Restoration Alternative

Under the Restoration Alternative, an analysis of historical water use on the Refuge resulted in an estimated median total annual use of 296,831 acre feet. Monthly use values calculated were reasonable with respect to available flow in Bear River. Additional water in July and September would be used if available, as indicated by an analysis of water use in a high flow year. Water use in 1943 was estimated to be 325,012 acre feet.

B. Enhancement Alternative

Under the Enhancement Alternative, the Refuge will have the capability to improve water supply and management. The construction of interior dikes, a bypass canal, and the ability to flush pools three times a year, could increase annual water use by 286,525 acre feet, totaling of 583,356 acre feet.

Fig. 4 Bear River Migratory Bird Refuge

Expansion Alternative

With FEE/EASEMENT Acquisition and Visitor Center Development

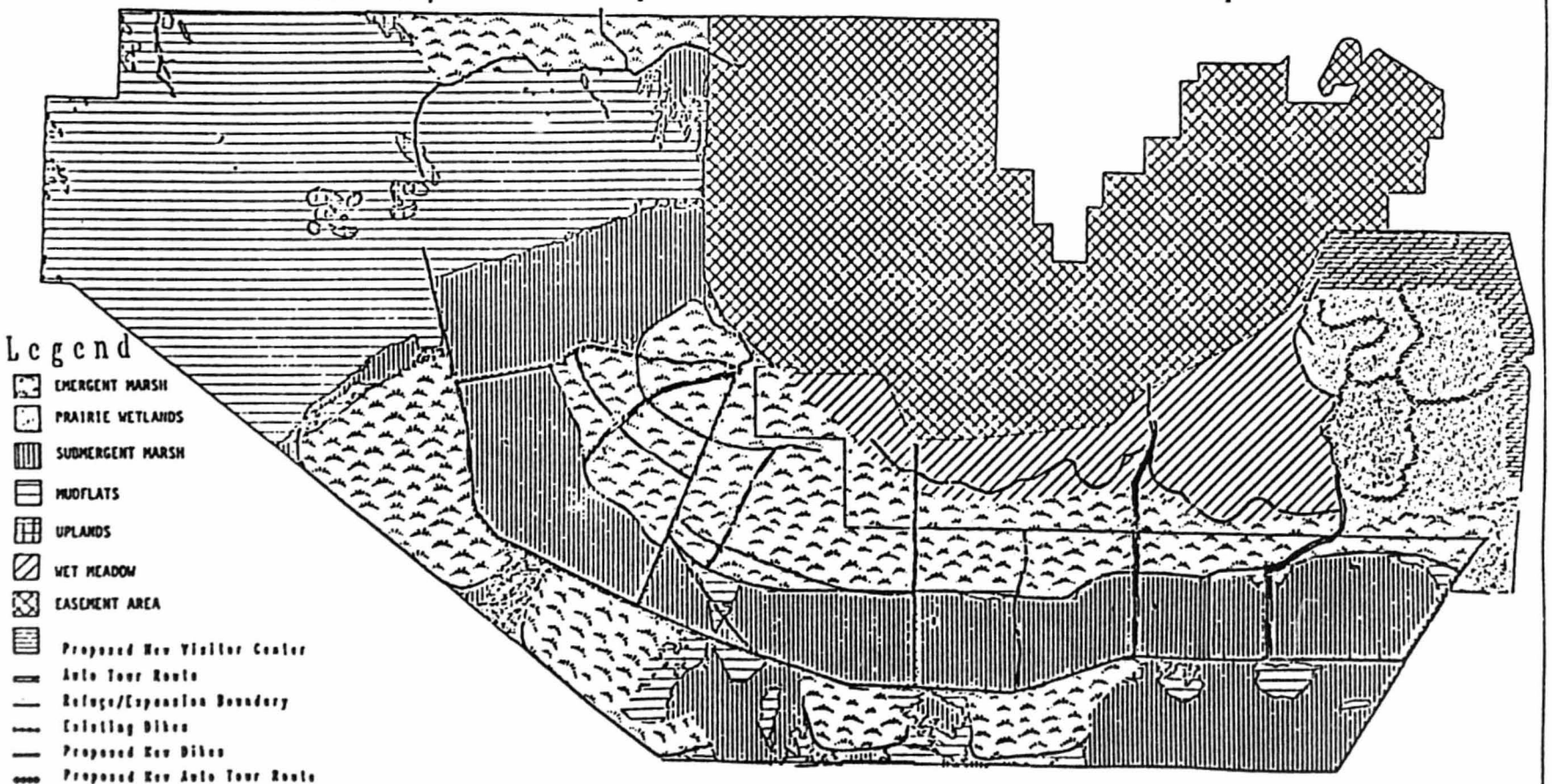


TABLE 6. EXPANDED ALTERNATIVE WITH CROSS DIKES (INCLUDING FEE TITLE LAND): IDEAL WATER MANAGEMENT

	EMERGENT MARSH AC	P-125%ET IN	FILL & MAINTAIN AC-FT	SUBMERGENT MARSH AC	P-85%ET IN	FILL & MAINTAIN AC-FT	FLUSH** TO 4205 FT	WET MEADOW AC	IRRIGATE IN	TOTAL AC-FT
REFILL	15800	12.00*	15800	16200	18.00*	24300	33065	7000	6.00	7000
MAR	15800	1.53	2015	16200	0.89	1202		7000	0.50	292
APR	15800	2.64	3476	16200	1.61	2174		7000	1.95	1138
MAY	15800	5.41	7123	16200	3.89	5252		7000	4.20	2450
JUN	15800	7.75	10204	16200	5.91	7979		7000	6.00	3500
JUL	15800	10.83	14260	16200	8.65	11678				
REFILL	15800	12.00*	15800	16200	18.00*	24300	33065			
AUG	15800	9.43	12416	16200	7.42	10017		7000	6.70	3908
SEP	15800	5.17	6807	16200	3.87	5225		7000	4.05	2363
OCT	15800	1.78	2344	16200	1.07	1445		7000	1.85	1079
REFILL	15800	12.00*	15800	16200	18.00*	24300	33065	7000	6.00	7000
TOTALS			106044			117869	99195			28729

* Inches needed to fill to management levels.

** Flush includes both submergent and emergent areas.

	BELOW D-LINE EMERGENT AC	MAINTAIN AC-FT	BELOW D-LINE SUBMERGENT AC	MAINTAIN AC-FT	MUDFLATS AC	2"FLUSH AC-FT
MAR	7600	1938	7600	1127	30400	5067
APR	7600	3344	7600	2039		
MAY	7600	6853	7600	4927		
JUN	7600	9817	7600	7486		
JUL	7600	13718	7600	10957		
AUG	7600	15200	7600	26600		
SEP	7600	11945	7600	9399		
OCT	7600	6549	7600	4902		
NOV	7600	2255	7600	1355	30400	5067
TOTAL		71617		68793		10134

DRY	
20% OF SUBMERGENT	502381
AND EMERGENT MARSH -	44782
	457599
AFTER	
70% DELIVERY	
EFFICIENCY =	653713
	TOTAL USE
	ACRE-FEET

TABLE 7. COMPARISION OF THE THREE ALTERNATIVE'S WATER USE (ACRE-FEET) WITH HISTORIC MONTHLY MEDIAN FLOW AVAILABLE IN THE BEAR RIVER (1932-1983)

	BEAR RIVER MEDIAN FLOW	HISTORIC USE	DIFFERENCE FROM RIVER	ENHANCED ALTERNATIVE	DIFFERENCE FROM RIVER	EXPANSION ALTERNATIVE	DIFFERENCE FROM RIVER
MAR	122070	73020	49050	98032	24038	118774	3296
APR	160066	15220	144846	13192	146874	15772	144294
MAY	162486	25727	136759	29013	133473	34471	128015
JUN	97921	38020	59901	42694	55227	50498	47423
JUL	13938	14814	-876	60972	-47034	64892	-50954
AUG	18249	12964	5285	195723	-177474	214490	-196241
SEP	34081	36645	-2564	28238	5843	33484	597
OCT	61890	45354	16536	8842	53048	11028	50862
NOV	76925	35067	41858	90531	-13606	110303	-33378
SUM	747626	296831		567237		653712	
STORAGE NEEDED			-3440		-238115		-280573

Probable flows of Bear River at Corrine, Utah.

PROBABILITIES	ANNUAL FLOWS
2%	3665964 AC-FT
10%	2845251 AC-FT
25%	2195004 AC-FT
50%	1059316 AC-FT
98%	430240 AC-FT

C. Expansion Alternative

Under the Expansion Alternative, the acquisition of additional lands could increase annual water use to 653,712 acre feet, 356,881 acre feet over historical use, and 70,356 acre feet over optimal water use under the Enhancement Alternative, based on flushing pools three times per year. Additional flushing of pools would enhance soil and water quality, increase Refuge productivity, and contribute to productivity of State lands south of the Refuge. It would be necessary to remove salts deposited during the flood. Water supplies have historically been inadequate to support Refuge requirements in late summer, but enhancement of existing structures and construction of new dikes on acquired lands could result in greatly improved storage and management capability.

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APPENDIX E

REFUGE BIRD LIST

BEAR RIVER MIGRATORY BIRD REFUGE

BIRDS OF BEAR RIVER MIGRATORY BIRD REFUGE

Common Loon
Horned Grebe
Eared Grebe
Western Grebe
Clark's Grebe
Pied-billed Grebe
White Pelican
Double-crested Cormorant
Great Blue Heron
Green Heron
Cattle Egret
Great Egret
Snowy Egret
Black-crowned Night Heron
Least Bittern
American Bittern
White-faced Ibis
Tundra
Canada Goose
White-faced Goose
Snow Goose
Ross's Goose
Mallard
Black Duck
Gadwall
Pintail
Green-winged Teal
Blue-winged Teal
Cinnamon Teal
European Widgeon
American Widgeon
Northern Shoveler
Wood Duck
Redhead
Ring-necked Duck
Canvasback
Greater Scaup
Lesser Scaup
Common Goldeneye
Barrow's Goldeneye
Red-tailed Hawk
Swainson's Hawk
Rough-Legged Hawk
Ferruginous Hawk
Golden Eagle
Bald Eagle
Northern Harrier
Prairie Falcon
Peregrine Falcon
Merlin
American Kestrel
Sage Grouse
Ring-necked Pheasant
Sandhill Crane
Virginia Rail
Sora
Common Moorhen
American Coot
Semipalmated Plover
Snowy Plover
Killdeer
Lesser Golden Plover
Black-bellied Plover
Ruddy Turnstone
Common Snipe
Long-billed Curlew
Spotted Sandpiper
Solitary Sandpiper
Willet
Greater Yellowlegs
Lesser Yellowlegs
Red Knot
Pectoral Sandpiper
Baird's Sandpiper
Least Sandpiper
Dunlin
Dowitcher
Stilt Sandpiper
Semi-palmated Sandpiper
Western Sandpiper

Bufflehead
Old Squaw
Harlequin Duck
White-winged Scoter
Surf Scoter
Ruddy Duck
Hooded Merganser
Common Merganser
Red-breasted Merganser
Turkey Vulture
Northern Goshawk
Sharp-shinned Hawk
Cooper's Hawk
Common Tern
Caspian Tern
Black Tern
Mourning Dove
Yellow-billed Cuckoo
Barn Owl
Great Horned Owl
Burrowing Owl
Long-eared Owl
Short-eared Owl
Common Poorwill
Common Nighthawk
Broad-tailed Hummingbird
Rufous Hummingbird
Calliope Hummingbird
Belted Kingfisher
Northern Flicker
Red-headed Woodpecker
Lewis's Woodpecker
Yellow-bellied Sapsucker
Downy Woodpecker
Eastern Kingbird
Western Kingbird
Say's Phoebe
Dusky Flycatcher
Horned Lark
Violet-green Swallow
Tree Swallow
Bank Swallow

Marbled Godwit
Sanderling
American Avocet
Black-necked Stilt
Wilson's Phalarope
Red-necked Phalarope
Herring Gull
California Gull
Ring-billed Gull
Franklin's Gull
Bonaparte's Gull
Forester's Tern
Water Pipit
Bohemian Waxwing
Cedar Waxwing
Northern Shrike
Loggerhead Shrike
European Starling
Orange-crowned Warbler
Nashville Warbler
Virginia's Warbler
Yellow Warbler
Magnolia Warbler
Yellow-rumped Warbler
Black-throated Gray Warbler
Townsend's Warbler
MacGillivray's Warbler
Common Yellowthroat
Wilson's Warbler
American Redstart
House Sparrow
Bobolink
Western Meadowlark
Yellow-headed Blackbird
Red-winged Blackbird
Northern Oriole
Brewer's Blackbird
Brown-headed Cowbird
Western Tanager
Luzuli Bunting
Evening Grosbeak
Cassin's Finch

Rough-winged Swallow
Barn Swallow
Cliff Swallow
Purple Martin
Black-billed Magpie
Common Raven
American Crow
Clark's Nutcracker
Black-capped Chickadee
Red-breasted Nuthatch
Brown Creeper
House Wren
Winter Wren
Long-billed Marsh Wren
Short-billed Marsh Wren
Mockingbird
Gray Catbird
Sage Thrasher
American Robin
Hermit Thrush
Western Bluebird
Mountain Bluebird

Pine Siskin
American Goldfinch
Green-tailed Towhee
Rufous-sided Towhee
Lark Bunting
Savannah Sparrow
Vesper Sparrow
Lark Sparrow
Sage Sparrow
Dark-eyed Junco
American Tree Sparrow
Chipping Sparrow
Brewer's Sparrow
Field Sparrow
White-crowned Sparrow
Lincoln's Sparrow
Song Sparrow
Lapland Longspur
Snow Bunting
Golden-crowned Kinglet
Ruby-crowned Kinglet
Townsend's Solitaire

APPENDIX F

REFUGE MAMMAL LIST

BEAR RIVER MIGRATORY BIRD REFUGE

MAMMALS OF THE BEAR RIVER MIGRATORY BIRD REFUGE

Vagrant Shrew (Sorex Vagrans)
Little Brown Myotis (Myotis lucifugus)
Yuma Myotis (Myotis yumanensis)
Hoary Bat (Lasiurus cinereus)
Blacktail Jackrabbit (Lepus californicus
Mountain Cottontail (Sylvilagus nuttalli)
Yellow belly Marmot (Marmota flaviventer)
Rock Squirrel (Citellus variegatus)
Uinta Ground Squirrel (Citellus armatus)
Northern Pocket Gopher (Thomomys talpoides)
Great Basin Pocket Gopher (Perognathus parvus)
Beaver (Castor canadensis)
Western Harvest Mouse (Reithrodontomys megalotis)
Deer Mouse (Peromyscus maniculatus)
Muskrat (Ondatra zibethicus)
Meadow Vole (Microtus pennsylvanicus)
Mountain Vole (Microtus montanus)
Norway Rat (Rattus norvegicus)
House Mouse (Mus musculus)
Porcupine (Erethizon dorsatus)
Red Fox (Vulpes fulva)
Nutria (Myocaster coypus)
Coyote (Canis latrans)
Long-tailed Weasel (Mustela frenata)
Mink (Mustela vison)
Badger (Taxidea taxus)
Striped Skunk (Mephitis mephitis)
Spotted Skunk (Spilogale gracilus)
Bobcat (Lynx rufus)
Mule Deer (Odocoileus hemionus)

APPENDIX G

DRAFT ENVIRONMENTAL ASSESSMENT COMMENTS

BEAR RIVER MIGRATORY BIRD REFUGE

DRAFT ENVIRONMENTAL ASSESSMENT COMMENTS

A second public meeting to review the draft environmental assessment was held June 5, 1991 at the Box Elder High School. A total of 115 persons attended this meeting, sixteen of whom made formal statements. In addition twenty-two written statements on the EA were received before the deadline for comments on July 9, 1991. Of the comments received, all but five favored the preferred alternative of expansion. Concerns raised by the public are summarized as follows:

- increased federal ownership of public lands
- increased water usage by the refuge
- restriction of pesticide use on adjacent private lands
- introduction of endangered species could affect agricultural interests
- reduction of surrounding land values by easement agreements
- nonconsumptive wildlife uses seemed to be favored over consumptive uses
- camping sites not addressed

These concerns are addressed in this final environmental assessment.

Copies of the written statements are attached to this Appendix. The Service response to these written statements is included below, while a summary of comments from the public meeting is included in this appendix.

Service response to five letters concerning hunting and airboats (use of airboats within the impoundments and outside the impoundments, below the D-Line Dike):

The Service considered allowing airboats within the impoundments for the waterfowl hunting, but rejected this idea due to the small size of the new refuge impoundments and the associated problems of movement of airboats between units. The disturbance factor would also be greater in the smaller units than in the previously large units of the refuge.

The refuge below the D-Line (outside the impoundments) will be open to waterfowl hunting and airboat access. Designed routes, launching facilities and parking areas will be provided for this access. The exact location of these facilities can not be determined until final redevelopment plans are finalized.

Service response to other items from Utah Air Boats, Inc. regarding camping facilities with an emphasis on non-consumptive uses:

Fish and Wildlife policy from 8 RM 9.5B. states that "camping may be permitted only when required to implement or sustain an approved wildlife/wildlands oriented recreational activity when no other alternative is practical." It is believed that there are ample private or State Park facilities close enough that camping on the refuge is not needed to carry on the wildlife oriented activity of hunting.

The trend of uses on National Wildlife Refuges is toward non-consumptive uses and, prior to the flood, consumptive use of Bear River Migratory Bird Refuge was only 10 percent of the total refuge use. Non-consumptive use will be the majority of public use with the new visitor center and environmental study area; however, provision will be made to continue these important and compatible consumptive uses. Refuge objectives are to increase consumptive uses under the Expansion Alternative.

Service response to concerns expressed by Mr. James W. Fisher regarding refuge expansion and additional federal ownership of lands:

Additional lands are required for the refuge to meet its objective for waterfowl and public use management. Without additional lands important upland nesting habitat is extremely limited and production goals for waterfowl cannot be met. Only limited public use facilities could be provided as permanent facilities can not be constructed on the existing refuge lands as they lie within the 100 year flood plain and facilities are prohibited. Additional land is needed for the public use facilities. It is believed that all lands identified for fee purchase are needed for the refuge to meet its mandated goals. Easement agreements make up better than half (56%) of the total expansion package and these lands will remain in private ownership.

Service response to Mr. Allen W. Stokes' concerns about public access into the marsh via boardwalks, predator control, and canoe trails:

Development of the Public Use Plan and facilities for the visitors center/public use area will incorporate boardwalks/natural trails and canoe trails to allow

the public access into the marsh areas. Predator management will not be undertaken until an EA and Predator Management Plan are completed. The objectives of this planning will not be to eliminate predators, but to keep them in check in order to meet wildlife and public use objective. Predator species will still be present on the area so that the visiting public will have an opportunity to observe them.

Service response to two letters from the Jeppesen's regarding pesticide restrictions that might be placed on acquired lands and concerns about the easement program and the acquisition of additional land:

The acquisition of additional lands has been addressed in previous comments. The Service will not put money into management programs to benefit hunt clubs. The easement will be a one time payment to insure only that the areas remain in/or near the same condition that they presently are and that no draining or filling will occur. A clause on the deed to these properties will insure that these wetlands will be protected. The Service has no authority to impose restrictions on the use of pesticides under current regulations. Mosquito control will be evaluated with the Box Elder Mosquito Abatement District and biological controls utilized for control when health hazards of non-control are evident. Costs and control methods will be negotiated with the County District.

Service response to State of Utah Division of Water regarding water rights for the Refuge.

Water rights is a complex issue that is not easily resolved. The Service recognizes that it cannot address all issues regarding water rights, but wanted to point out optimum water needs should the water become available for use. The Service's Water Right Division will continue to work with the State on water rights problems as they regard the refuge with the goal of achieving water needed to operate the refuge effectively in compliance with State laws and mandates. The water rights issue will be decided in a legal proceeding, and the Service may not get the water needed for optimum water management needs.

The Service will acquire existing agricultural water rights with lands proposed for acquisition. Application will be made to the Division of Water Rights to change use under those rights from irrigation to fish and wildlife. No change in use would be implemented if the vested water rights of other users would be impaired. The Service recognizes the existence of the Bear River Compact,

which allocates post-1976 water depletions among Utah, Idaho, and Wyoming and will work with those States in the refuge development planning process.

Service response to the Box Elder County Commissioners concerns regarding farmland:

Management of the refuge will be compatible with traditional agriculture practices, including pesticide use. Grazing will be permitted on portions of the refuge when needed for wildlife management purposes. The water rights issue has already been addressed. Introduction of a federally protected species will require an EA covering the introduction and the public would have a chance to comment upon it at that time. No property or water rights will be acquired except on a willing-seller basis.

Service response to Mr. Rodger Worthen's concerns regarding easements on hunt clubs and proposed dams on the Bear River:

The Bear River Club has donated $10,000 to refuge volunteers for the restoration effort and proposed spending additional funds to construct a dike in Unit 1. There are no special hunting regulations affecting the private clubs, they are regulated by the same laws and regulations that effect everyone who hunts. No new clubs will result due to the expansion proposal, in fact some clubs may be eliminated. The proposed dams on the Bear River will eliminate high spring flows and even out flows throughout the year which, in the long run, will be a benefit to the refuge.

Service response to South Box Elder County Farm Bureau's concerns of (1) endangered species and pesticide use, (2) water rights and development, (3) farming and grazing, and (4) wildlife damage:

The first three items have been addressed in prior responses. The Service believes that there will be no increase in wildlife damages as a result of the expansion since the majority of the lands are now being used or support wildlife populations. Our objective for the refuge shows and increase in wildlife use days, but a vast majority of that is due to increased acreage. Should wildlife damage problems occur they will be handled through Animal Damage Control of the Department of Agriculture.

Service response to Bear River Canal Company's concerns about removing land from the tax rolls, water uses, and additional water needs:

Additional water needs have been addressed in prior responses. The majority of water rights the Service will acquire are presently used for wildlife habitat management. Some water rights that might be acquired are currently used on agricultural lands. These would be converted to wetland management, a valid use of water, though not that which the original water filing stated it would be. These water rights, if purchased, would be converted to wetland use. Land removed from tax roles will not cause a burden on tax payers since payments in lieu of taxes will be an increase to the County of approximately $12-18,000 per year over payments now received on the land in private ownership.

In summary: Thirty-eight statements regarding the draft environmental assessment were received (16 statements at the public meeting and 22 written statements) with 33 of those expressing support for the expansion alternative and five expressing opposition for one reason or another to the expansion alternative, but stating they could support the enhancement alternative.

INTRA-AGENCY SECTION 7 CONSULTATION
RESTORATION AND EXPANSION
BEAR RIVER MIGRATORY BIRD REFUGE

LISTED SPECIES AND SPECIES OF CONCERN: Listed species include: (1) bald eagle (Haliaeetus leucocephalus); and (2) peregrine falcon (Falcon peregrinus) and Species of Concern are: (1) white-faced ibis (Plegadis chihi) and (2) snowy plover (Charadrius alexandrinus).

PURPOSE AND NEED: The Bear River delta's unique wildlife values have been recognized nationally as an historical waterfowl and waterbird area enjoyed by the public through hunting, trapping, sightseeing, photography, and nature study activities. The purpose of the action is to preserve and manage these values for future generations.

Because the entire Refuge and much of the proposed expansion area were flooded by the Great Salt Lake beginning in 1983, much of the existing habitat has been destroyed. In 1987, flood water reached peak elevation, covering all Refuge dikes with approximately four feet of water. Although it receded rather rapidly, much of the marshland habitat and all Refuge facilities were damaged or destroyed. With this in mind, the U. S. Fish and Wildlife Service evaluated management options for the reconstruction and/or expansion of the Refuge.

Numerous alternative actions that would fulfill the Service mission were discussed, four of which were selected for consideration: 1) No Action, 2) Restoration of Existing Refuge, 3) Enhancement of Existing Refuge, and 4) Enhancement and Refuge Expansion, the preferred alternative.

Under the Expansion Alternative, the Service would expand the Refuge through land acquisition of 38,200 acres. This action allows for intensive wildlife and public use development and protection of wetlands situated outside the present boundary. Two types of land acquisition are proposed - fee title: 16,891 acres and perpetual easement: 21,309 acres.

AFFECTS ON THE ENVIRONMENT: The entire present refuge containing 64,000 acres, plus the proposed expansion of 38,200 acres would be affected under this action as new water management facilities would be constructed to allow for more efficient water management. New cross dikes, water control structures, and canals/drains would be constructed. This action will reverse the current loss of wildlife benefits which have been occuring over the past several years. Two endangered species, the bald eagle and the peregrine falcon would show increased use days, as would two species of special concern, the white-faced ibis and the snowy plover.

ENVIRONMENTAL CONSEQUENCES: Increased wetland habitat would be enhanced and protected. Bald Eagle use occurs during the spring and fall migration with approximately 50 individuals during the fall and as high as 350 birds during the spring. Populations are present on the refuge for a period of about 60 calendar days per year. Peregrine falcons are never numerous in the area with peaks of 1 to 2 birds during both the spring and fall migrational periods. For the past three years, a nesting pair of peregrine falcons have been present on the Bear River Club and occasionally use the existing refuge as a feeding area. White-faced ibis, a species of concern, prior to the flooding had three major rookeries on the refuge and proposed expansion area. The proposed alternative is expected to provide habitat for at least two more major rookeries and increase production by 700 birds per year. Management of improved wetland habitat would also provide increased habitat for snowy plover and production is expected to double to approximately 100 young per year. All wetland dependent species would benefit. There would be only limited disturbance to any species during the construction phase and most would occur when no endangered species were present during the summer months. Ample habitat exists outside the immediate construction area to meet the needs of species during the construction period. There would be no social/economic impacts, except for the increased dollars which would be available to the community during the construction phase, but many benefits would be derived to the public upon the completion of this project. Not only would additional wetlands be protected and enhanced, wildlife use days increased, but it would be possible to provide public use facilities and environmental education facilities.

CONSULTATION AND COORDINATION: Intra-agency consultation with the U. S. Fish and Wildlife Enhancement Office in Salt Lake City, Utah regarding Section 7 of the Endangered Species Act resulted in a finding of no significant impacts as the result of the proposed action.

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